

ORAL REHABILITATION OF A GUNSHOT INJURY: A CASE REPORT

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Abstract

Internal wire fixation applied as a result of the fragmental fractures which occurred in mandible after gunshot injury can cause aesthetic, phonetic, functional and critical psychological problems in the patient. Several challenges are witnessed in the prosthetic rehabilitation of these patients such as retention and stability. The cost of implant applications which can support prosthesis of patients and the need for extra surgical operation after the reconstruction of the defect can affect patients psychologically and make their prosthetic rehabilitation more difficult. Removable denture with perfectly constructed skeleton infrastructure can provide sufficient function to this group of patients and help the patients to comfort themselves. In this case study, oral rehabilitation of the defects of a 35 years old male patient due to the reconstruction and fixation of upper and lower maxillas as a result of gunshot injury is presented. Applied tooth-mucosa supported removable partial denture ensured the fixation of aesthetic, functional and phonation problems of the patient and assured his motivation. It has been shown that removable partial prosthesis designed and applied according to the characteristics of defects is satisfactory as an alternative treatment in mandible and maxilla defects.

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Introduction

Trauma is the leading cause of death for people under the age of 40. Maxilla-facial trauma (MFT) is an important health problem which is frequently encountered. Although the phenomena are accompanied by other systemic injuries, patients with isolated maxilla-facial injuries can also be encountered. Etiologies of MFTs show variance from one society to another depending on socio-cultural structures. The frequency of maxilla-facial traumas among all traumas varies between 45.3% and 60%. In the literature it is stated that the male to female ratio

of MFT patients is between 2.1/1 and 7/1 and the incidents are mostly witnessed in males under the age of 40¹. In developing countries the incidence of MFTs caused by motor vehicle accidents is higher whereas in developed countries the most frequent cause of MFTs is battery. In dealing with MFT patients, the treatment of accompanying systemic injuries is as important as MFT itself. Most of these patients can show functional defects in the long run such as chewing problems and respiratory disorders in addition to aesthetic problems^{1,2}.

Maxillofacial defects can occur due to congenital, acquired or developmental causes. Among acquired defects maxilla-facial traumas (gunshot injuries, traffic accidents), surgical resection of neoplasms and defects caused by infectious diseases (osteomyelitis, syphilis) can be listed. Lip-palate fissures and craniofacial fissures can be classified under congenital defects, whereas soft tissue anomalies, chewing muscle anomalies and skeletal anomalies can be shown as examples of developmental defects³⁻⁵. General ethiology of acquired defects in

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maxillofacial area is traumatic injuries and resection of tumours⁶. Particularly the acquired maxillofacial defects can cause important aesthetic and functional disorders and psychological side effects in the patient. As a result of defects formed in the maxilla oronasal and oroantral relation which end up with eating, speaking and respiratory disorders or deviation of mandible towards the affected side as a result of the defects formed in the maxilla can result in serious chewing, drinking, swallowing, speaking malfunctions and aesthetic problems. These difficulties deteriorate the living quality of the patient and affect him/her negatively in psychosocial aspects³⁻⁷.

Surgical treatment in gunshot injuries in the facial area generally consist of 3 stages: total extracting and cleaning of all foreign materials, damaged and infectious tissues in the wound, stabilization of fractures and primary closure; re-fixation of hard tissues, ensuring sufficient coverage of soft tissues, adaptation of oral vestibule, alveolus are adapted with a second surgical fixation so that the back and residuals can be cleaned^{8,9}. The fractures that occur in the mandible due to gunshot injury have been treated with a number of methods including closed reduction, external pin fixation, internal wire fixation and more recently open reduction, and internal stable fixation using plaques and screws⁹. Before reliable implants and instruments for rigid fixation were developed, mandible fractures caused by gunshot injuries were treated with closed reduction. This method was applied in order to prevent periosteum scraping of fractured bone particles and disrupting of circulation. Open reduction is, first of all, disadvantageous as it has negative impact on treatment results which require internal wire fixation. Infections and nonunion of bones are frequent in open reduction. Particularly in gunshot injuries, several authors recommend partial necrosis segments with conservative treatment methods in order to avoid periosteum scraping¹⁰⁻¹².

Recently some authors maintain that fragmental fractures are united with open reduction and internal stable fixation by using plates and/or screws. Li and Li¹³ recommended the treatment model with auxiliary maxilla-mandible fixation (MMF) in multiple particle mandible fractures in addition to open reduction and internal fixation (reconstruction plate). On the

other hand, several maxillofacial surgeons who object to treating fragmental mandible fractures with open reduction and internal fixation suggest treatment with closed technique in order to ensure blood circulation in bone segments¹⁴.

Rehabilitation of these defects is restored with prosthetic methods after being subjected to surgical reconstruction^{15,16}. In cases which hinder fixed partial denture application such as socio-economic, systematic or local conditions, removable partial denture application is a good alternative. However, classical methods applied in the adaption of maxillofacial dentures sometimes are not adequate^{3,4}. In recent years the high success rate achieved in osseointegrated implant supported oral dentures showed that the low adaption level which is a problem in maxillofacial dentures could be overcome by using implants^{17,18}.

In this case study, prosthetic rehabilitation of unilateral maxillary and mandibular segmental defects caused by surgical reconstruction of left segments of maxilla and mandible as a result of gunshot injury is presented.

Case Report

Anamnesis records of the 35 years old male patient who applied to Prosthetic Dental Treatment Department of Dentistry Faculty, Dicle University, showed that he had undergone a series of operations as a result of gunshot injury in 2005, that fixation with platinum plaque was applied on the lower jaw, and that acquired defects were existent on the right side of lower and upper jaw due to the trauma and the operations that followed. In addition, it was reported that autogenous bone graft was applied to the lower and upper jaw for reconstruction of the defected area. It was determined that he had no systematic problems but smoked one pack of cigarettes daily. In extraoral examination it was observed that he had facial asymmetry and a scar tissue on the left side of the face, and slight slump in the left cheek. Oral examination showed that the patient had partial edentation, the palate was soft in the back where upper jaw was defective and crest level was insufficient in the lower jaw due to defect (Figure 1, 2). During reconstruction of defects, radiographic (Figure 3) and clinical evaluation displayed that the second premolar tooth in the upper right side consisted only of the root.



Figure 1. The view of lower jaw before treatment



Figure 2. The view of upper jaw before treatment



Figure 3. Panoramic X-ray (OPG)

It was recorded that due to partial edentation and defect, the patient suffered from chewing and swallowing difficulties and speaking disorders. In order to cure these problems and rehabilitate the patient psychologically, removable partial denture with skeletal framework application to the upper jaw and classical partial denture application to the lower

jaw was planned taking into consideration the socio-economic status of the patient and particularly the mucosa thickness of the crest where the denture would be placed in the lower jaw.



Figure 4. Preparation of upper jaw teeth and first impression of lower jaw

The patient was informed in detail about treatment options and his approval was obtained. In particular the upper left premolar tooth of the patient was taken out due to excessive crown damage; the lower jaw was made suitable in prosthetic terms as fixation screws directly contacted the mucosa. His previous restorations were removed and periodontal treatment was performed. At prosthetic treatment stage, preparations of the teeth no. 13 and 16 were designed with chamfer marginal termination according to metal supported ceramic preparation principles and applied. At impression stage, retraction type (Stay-put, Medium; Roeko, Langenau, Germany) was placed in order to reduce gingival crevicular fluid followed by teeth measurement with type A additional silicon impression material (A-Silicone Elite HD+, Zhermack, Rovigo, Italy). On the lower jaw, impression was taken with type A additional silicon pattern material depending on the size of the defect (A-Silicone Elite HD+, Zhermack, Rovigo, Italy)(Figure 4). As for upper teeth, metal framework was rehearsed (Ceralloy, Irwindale, USA) and colour characteristics of the teeth were determined with conventional methods using Vita 3D Master (Vita Zahnfabrik, Bad Säckingen, Germany) colour scale. After low temperature porcelain (Ceramco, York, USA) was applied on the metal framework with bedding method, at

dentin rehearsal stage, the necessary aesthetic and functional assessments were made. Following glazing procedure, restorations were cemented to the teeth by means of zinc-polycarboxylate cement (Adhesor Carbofine Zinc polycarboxylate cement, Spofa Dental, Jicin, Czech Republic).

Following cementation, the impressions of the patient were taken with hydrocolloid impression material (Hydrocolor 5, Zhermack, Zhermack SpA., Badia Polesine, Italy) and personal measuring tray was obtained for upper jaw from acrylic resin on model. Using the previously obtained model, personal impression tray was obtained for lower jaw from acrylic resin on model. Second impression was performed with hydrocolloid impression material (Hydrocolor 5, Zhermack, Zhermack SpA., Badia Polesine, Italy) using personal impression tray (Figure 5).



Figure 5. Second impression of maxilla and mandible

After working models were obtained with the measures taken, metal skeletal framework of the upper jaw was moulded (Figure 6).



Figure 6. View of mandible skeletal metal framework.

Upper jaw removable denture, metal framework and lower jaw denture base were intraorally rehearsed and lower-upper wax patterns were prepared. Then, in accordance with the vertical size of the patient, lower-upper models were transferred to the semi-adjustable articulator. After an ideal occlusion was ensured and tooth composition was performed, rehearsal was conducted with the patient. Occlusion and vertical size was controlled in the mouth of the patient followed by conventional denture finishing processes. After acrylic impulse and polymerization, polymerization was performed with silicon liner material (Molloplast-B, DETAX, Ettlingen, Germany) was applied in order to eliminate traumatic effect that can occur in the bone and mucosa that surround the defect particularly during the usage of the denture that is in contact with lower defect mucosa. As a result of the prosthetic treatment, the lost functions, aesthetic and phonation characteristics were restored and no problem was encountered in terms of patient's acceptance of the dentures (Figure 7, 8).



Figure 7. Post-treatment oral view.



Figure 8. View of lower and upper jaw removable dentures.

The patient was controlled in 6 months intervals for denture check and monitoring of oral hygiene.

Discussion

In maxillofacial gunshot injuries the purpose is to ensure primary healing in the soft tissues as well as obtaining integrity of bone structure which will give satisfactory results in aesthetic and functional terms^{1,2}. As regards maxillary defects, and especially in soft tissues, ensuring structural integrity and continuity and restoration is essential by creating alveolar crest with appropriate size and form. In cases of larger mandibular fractures, the relation of soft tissue with neighbouring areas and upper jaw might be lost. In advanced defects, bone graft and reconstruction of defects can be reconstructed. The volume and localization of defects in mandible and maxilla as well as connection of facial and masticatory muscles can be challenging to clinicians¹⁶⁻¹⁸. In this particular case, losses in bone and soft tissue levels and especially the reduction in vestibule depth in left segment of mandible and the loss of nonkeratinized areas in the upper parts of alveolar bone were disadvantageous. Despite all these drawbacks, the treatment option best suitable for the patient was preferred.

Radical surgery applied for gunshot injuries and orofacial cancers often requires wide resectioning of the tissues in this area. As a result, the patient can suffer from anatomic defects, cosmetic, functional and psychological problems. At the planning stage of the treatment, assessment of the situation by surgeon and prosthodontist is necessary for the success of prosthetic rehabilitation. This is the best way for the prosthodontist to prepare the most successful prosthesis for intraoral and extraoral defects^{3,4}. Resectioning of hard-soft palate and perimeter structures result in anatomic defects and malfunctioning in oral cavity and oropharynx. Swallowing and speaking disorders occur due to the distortion of rational segregation. This type of patients must be seen first by an expert of maxillary and facial prosthesis. Diagnostic measures must be taken and dental models must be obtained.

Traumatically injured patients need specific treatment. In patients with maxillofacial defects, due to the high success rate obtained

with osseointegrated implant supported intraoral dentures, it is recommended that implants are applied for retention problems which is an essential issue in maxillary-facial prosthesis. In addition, this treatment option can offer such advantages as protection of soft and hard tissues, increased retention and stability of dentures^{18,20}. Mijiritsky and Karas¹⁹ stated that in cases when financial, systematic or local conditions prevent application of fixed partial dentures, it would be a good alternative to implement removable partial dentures. In our case, implant supported fixed denture was considered at the beginning. As a result of the analysis, it was observed that the patient had group-function type occlusion in the toothed side and that the inter-occlusal distance between crest peak of the defected area and antagonist dental arc was not suitable for construction of implant-supported fixed restorations; in addition, as the patient smoked approximately one pack of cigarettes a day, and due to his financial situation, treatment plan was modified. Implant supported fixed dentures can be desirable for this type of major traumas, but in this case the patient did not want vertical bone augmentation depending on the repetition of surgical procedures required for implant treatment. As a result, upon the approval of the patient, removable partial denture was applied.

Removable partial denture applications have been widely accepted in dentistry. Dentures must be designed so that the lost functions of patients can be restored and their oral structure can be preserved. Tooth-tissue supported removable dentures and the body part of freely finished dentures are relatively supported by a combination of rigid teeth, resilient mucosa and the bone underneath. If partial denture cannot be designed correctly, luxation in teeth and resorption in alveolar crest can occur. Measurements and denture planning in these patients must be able to distribute the mastication power equally by obtaining maximum support from supporting teeth and toothless areas.

Border casting helped to establish optimal extension of the denture base and peripheral seal while preventing functional interference with the oral musculature. That the finishing of denture borders are regular and smooth denture surface contacts are polished is critical for the stability of dental dentures^{21,22}. It has been shown that an orderly designed and applied removable

partial denture is satisfactory as an alternative treatment in segmental mandible and maxillary defects^{19,21,22}.

Conclusion

Traumatically injured patients require specific treatment. The treatment of these patients requires teamwork which involves several branches. In this case, aesthetic, functional and phonation problems of the patient with lower-upper maxillary defect due to gunshot injury were eliminated by application of removable partial dentures.

Declaration of Interest

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