

**SECTIONAL MANDIBULAR COMPLETE DENTURE FOR A TOTAL MAXILLECTOMY  
 PATIENT WITH TRISMUS: A CLINICAL REPORT**

**Trismuslu Total Maksillektomi Hastasının Mandibular Parçalı Tam Protez ile Tedavisi: Olgu Bildirisi**

Tamer ÇELAKIL, Azize DEMİR, Haluk KESKİN

Received: 28/09/2016

Accepted: 11/11/2016

**ABSTRACT**

This report presents the case of a 60-year-old male patient with trismus induced by radiotherapy and fabrication of a sectional mandibular complete denture to allow the insertion of the denture into the mouth. A mandibular sectional denture was designed in two pieces with a locking mechanism by using mini anchor and ball abutment housing with cap. Patients who have undergone maxillectomy often have constricted mouth openings, as a result of surgical intervention and radiotherapy, and complain of an inability to insert or remove dentures. A new approach is vital for sectional dentures because existing sectional denture fabrication techniques cannot meet the ongoing needs of trismus patients. The mini anchor system with ball abutment housing has better mechanical retention in acrylic resin and can provide favorable stabilization during masticatory function; thus, additional framework is not required for assisting in stabilization and retention.

**Keywords:** Complete denture; denture design; trismus; radiotherapy; maxillectomy

**ÖZ**

Bu olgu bildirisinde, radyoterapiye bağlı trismus şikayeti bulunan 60 yaşındaki erkek hastada ağız açıklığındaki kısıtlılık nedeniyle yapılan parçalı mandibular tam protezin üretim aşamaları sunulmuştur. Parçalı mandibular tam protez, mini ankerler ile implant üstü protezlerde kullanılan top başlı tutucu sistemlerin plastik tutucu parçasına sahip metal yuvalar arasında kilit mekanizması oluşturularak iki parça halinde tasarlanmıştır. Maksillektomi geçirmiş hastalarda genellikle cerrahi girişimlere ya da radyoterapiye bağlı ağız kısıtlılıkları görülür. Bu durum, hareketli protezlerin hasta tarafından takılıp çıkartılmasını zorlaştırır. Trismus hastalarında yeni bir parçalı protez üretim yaklaşımı belirlenmesi önemlidir. Çünkü mevcut parçalı protez üretim teknikleri bu hastaların ihtiyaçlarını karşılayamamaktadır. İmplant üstü protezlerde kullanılan top başlı tutucu sistemlerin plastik tutucu parçasına sahip metal yuvalar ile mini anker sistemlerin akrilik reçine içerisindeki mekanik tutuculuğu, çiğneme fonksiyonu esnasında kabul edilebilir bir stabilizasyon sağlar. Bu yaklaşım parçalı protezlerde stabilizasyon ve retansiyon için kullanılan ilave altyapı ihtiyacını ortadan kaldırır.

**Anahtar kelimeler:** Tam protez; Protez tasarımı; trismus; radyoterapi; maksillektomi



## Introduction

Trismus is defined as the limited mouth opening of any etiology (1). Trismus may be caused by intra-oral surgical procedures such as maxillectomy and radiotherapy (RT) to treat head and neck cancer, and there is a correlation between the absorbed radiation dose by the mastication structures and mouth opening (2). Radiation-induced trismus is related to abnormal proliferation of fibroblasts (also called fibrosis) and damage to the muscles of mastication (3, 4). Dijkstra *et al.* (5) described a mouth opening of 35 mm or less as trismus in head and neck oncology patients. Accordingly, presence of trismus may limit the maintenance of oral health and dental treatments.

Prosthodontic treatment of a patient with trismus is a complex procedure, due to the limited mouth opening. Flexible and sectional prostheses are generally fabricated to provide prosthodontic treatment for patients with maxillofacial defects, microstomia, and trismus. Design of a sectional denture should provide satisfactory function and simplicity of insertion/removal of large prostheses (6). Different impression methods and sectional denture fabrication techniques have been described for patients with limited mouth openings, including hinges (7-10), pin attachments (8, 11), swinglock attachments (12, 13), cast locking recesses (14), stud attachments (7, 15), telescopic systems (13, 16), clasps (17), and magnetic attachments (6, 18-21). Yenisey *et al.* (10) have used a micro-anchor as a secondary labial lock to prevent denture deflection during chewing. They considered the hinge design alone insufficient to provide uniform retention and stability.

This clinical report describes a different design for a sectional mandibular complete denture for an edentulous total maxillectomy patient with trismus induced by RT.

## Case Report

A 60-year-old male patient with trismus induced by RT presented to the Department of Prosthodontics of Istanbul University for prosthodontic treatment of a total maxillary defect and edentulous mandibular arch with a limited maximal mouth opening measuring approximately 25 mm (Figure 1). The level of oral hygiene was poor and the patient had no prior experience with a maxillary or mandibular removable denture. Various prosthodontic treatment options were considered and the patient agreed to a treatment plan

including the fabrication of a sectional mandibular denture and maxillary obturator prosthesis.

The preliminary impressions (with irreversible hydrocolloid) for maxillary defect and mandibular arch were made with edentulous perforated-stock impression trays. The impressions were cast in ADA type III stone (Denston 3, Ata Dental Stone Products, Ankara, Turkey) and autopolymerizing acrylic resin (Vertex, Vertex-Dental BV, Zeist, Netherlands), and a custom tray was fabricated on each stone cast.



**Figure 1.** Patient with limited mouth opening induced by radiotherapy.

Maxillary impression for the maxillary defect was made according to 2-step procedure with one piece perforated-custom impression tray and vinyl polysiloxane (Optosil/Xantopren L, Heraeus Kulzer, Hanau, Germany). For the mandibular impression, green stick modeling plastic impression compound (Impression Compound; Kerr Corp, Orange, CA, USA) was used for border molding and a zinc-oxide eugenol impression paste (Cavex Holland BV, Haarlem, Holland) was used to make the definitive impression with one piece custom impression tray. Both definitive impressions were poured with ADA type IV stone (Fujirock EP, GC Corp, Tokyo, Japan).

Maxillary and mandibular record bases were fabricated in one piece and trimmed shorter than the expected buccal, vestibular and lingual outline form, allowing for insertion into the mouth. Maxillomandibular relationship in centric relation was recorded and the definitive casts were mounted on a semiadjustable articulator (Artex, AmannGirr-bach AG, Koblach, Austria). At the trial stage, artificial teeth (Optodent, Bayer, Leverkusen, Germany) were arranged with posterior balancing ramps to achieve eccentric balanced occlusion and the dentures were completed conventionally in one piece with heat-

polymerized polymethyl methacrylate (PMMA) (Meliodent; Bayer UK Ltd, Newbury, UK). At the delivery appointment, because of the limited mouth opening and the height of the posterior mandibular alveolar ridge, it was impossible for the patient to place the mandibular denture in the mouth after insertion of the maxillary obturator prosthesis; thus, a mandibular sectional denture was designed in two pieces with a locking mechanism, by using mini anchor and ball abutment housing with cap (Figure 2).



**Figure 2.** Mini anchors and ball abutment housings for sectional mandibular denture.

Before sectioning the mandibular denture, six points were marked on the vestibular and lingual outline of the definitive cast and denture to obtain a section guideline, and the denture was sectioned along this guideline with a thin cutting disc (Bur no: 806.104.355.514.190.X; Finzler, Schrock & Kimmel GmbH, Bad Ems, Germany) (Figure 3A and Figure 3B). An irreversible hydrocolloid was used for impression of the inner surface of the upper segment of the denture, and impression material was poured in dental stone to obtain a stone index (Figure 4A and Figure 4B). This stone index was used for recovering the loss of PMMA with autopolymerizing acrylic resin during the separation process (Figure 4C).

Two solid male thread anchors with inox threaded caps (M2,5 Anchor System; Servo-Dental, Hagen, Germany) with a 3.90 mm circumference and 3.75 mm height were placed in the lower segment of the mandibular denture. Two hollow cavities were made on the canine regions and mini anchors were placed in these cavities with autopolymerizing acrylic resin (Figure 5A). Two ball abutment housings with caps (Trias-Implant System; Servo-Dental GmbH & Co. KG, Hagen, Germany) were attached on mini anchors, and the positions of abutment housings in the upper segment of the mandibular denture were marked by

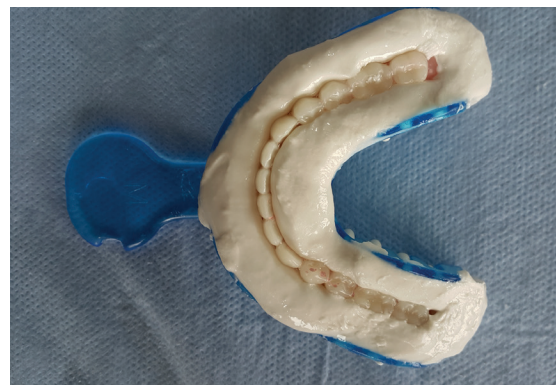
using a spirit-based pen (Figure 5B).



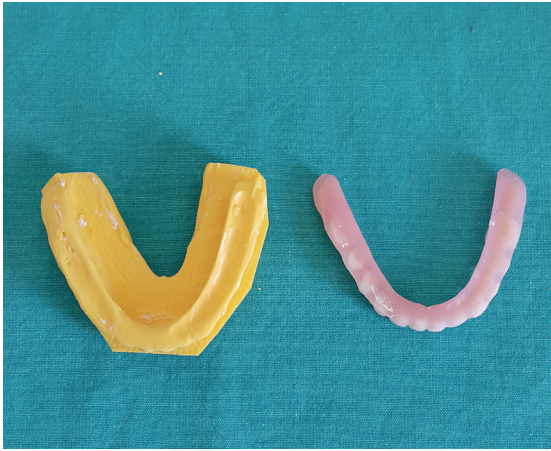
**Figure 3A.** Six points were marked on the definitive cast and denture for cutting guidelines.



**Figure 3B.** Denture was sectioned with cutting disc.



**Figure 4A.** Inner surface of the upper segment impression was made with irreversible hydrocolloid.



**Figure 4B.** Stone index was obtained.



**Figure 4C.** Lower segment was recovered with autopolymerizing acrylic resin by using stone index.

Two hollow cavities were made on the upper segment of the mandibular denture, and ball abutment housings were secured extraorally with autopolymerizing acrylic resin. To prevent the contact of the autopolymerizing acrylic resin with the lower segment, a circular spacer was adapted on the mini anchors during the pickup procedure. Autopolymerizing acrylic resin was then polymerized and the two segment mandibular denture was completed (Figure 5C and Figure 5D). The lower segments were first inserted into the mouth; then the upper segment was attached on the lower segment (Figure 6A and Figure 6B). The patient was provided home care instructions on the operation of the sectional mandibular denture. The patient stated his satisfaction with this method of insertion (Figure 7). Recalls have been performed every 3 months and follow-up was continued over 1 year with satisfactory results.



**Figure 5A.** Positions of mini anchors were marked on canine regions.



**Figure 5B.** Abutment housings were attached on mini anchors.



**Figure 5C.** Abutment housings were secured with autopolymerizing acrylic resin.



**Figure 5D.** Two segment mandibular denture was completed.



**Figure 7.** Frontal view of midfacial contour.



**Figure 6A.** Lower segments were placed.



**Figure 6B.** Upper segment was attached on lower segment.

### Discussion

Prosthetic rehabilitation of maxillectomy patients with radiation-induced trismus is often difficult because of the limited mouth opening. Various fabrication techniques of sectional or collapsible dentures have been reported for patients with limited diameter and circumference of mouth opening. However, for the present case, there was need for a sectional denture to overcome the limited vertical mandibular opening caused by radiation-induced trismus. Thus, a new approach was vital for the sectional denture because existing sectional denture fabrication techniques could not meet patient's needs.

Dental magnet attachments are useful to facilitate the joining of the two sections in sectional dentures. However, these attachments have some limitations against lateral masticatory forces. Matsumura and Kawasaki (6) reported occasional dislodging of the segment during chewing and suggested an additional retentive structure to stabilize the sectional denture. Furthermore, magnet attachments have no mechanically retentive surfaces for placement into the dentures, and adhesive resin systems are required for fixing these attachments in acrylic resin materials (6). Compared with magnet attachments, the advantage of a mini anchor system with ball abutment housing is that the mechanical retention in acrylic resin can be obtained with inox threaded caps.

Also, male thread anchors can provide favorable stabilization during the masticatory function; thus, additional framework is not essential for assisting in stabilization and retention.

## Conclusion

This patient has worn the maxillary obturator prosthesis and mandibular sectional denture for 1 year and subsequent recall appointments revealed satisfactory function. This report described a removable sectional denture connected by ball abutment housings and a mini anchor system consisting of an inox threaded cap with solid male thread anchor for a maxillectomy patient with radiation-induced trismus.

## Acknowledgements

The authors thank Servo-Dental for Anchor Systems materials and AC Dental for their support in terms of implant components in this manuscript.

## Source of funding

None declared.

## Conflict of interest

None declared.

## References

1. Beekhuis GJ, Harrington EB. Trismus. Etiology and management of inability to open the mouth. *Laryngoscope* 1965;75:1234-1258.
2. Rapidis AD, Dijkstra PU, Roodenburg JL, Rodrigo JP, Rinaldo A, Strojjan P, Takes RP, Ferlito A. Trismus in patients with head and neck cancer: Etiopathogenesis, diagnosis and management. *Clin Otolaryngol* 2015;40(6):516-526.
3. Okunieff P, Augustine E, Hicks JE, Cornelison TL, Altemus RM, Naydich BG, Ding I, Huser AK, Abraham EH, Smith JJ, Coleman N, Gerber LH. Pentoxifylline in the treatment of radiation-induced fibrosis. *J Clin Oncol* 2004;22(11):2207-2213.
4. Wang CJ, Huang EY, Hsu HC, Chen HC, Fang FM, Hsiung CY. The degree and time-course assessment of radiation-induced trismus occurring after radiotherapy for nasopharyngeal cancer. *Laryngoscope* 2005;115(8):1458-1460.
5. Dijkstra PU, Huisman PM, Roodenburg JL. Criteria for trismus in head and neck oncology. *Int J Oral Maxillofac Surg* 2006;35(4):337-342.
6. Matsumura H, Kawasaki K. Magnetically connected removable sectional denture for a maxillary defect with severe undercut: A clinical report. *J Prosthet Dent* 2000;84(1):22-26.
7. Cura C, Cotert HS, User A. Fabrication of a sectional impression tray and sectional complete denture for a patient with microstomia and trismus: A clinical report. *J Prosthet Dent* 2003;89(6):540-543.
8. Gozde Turk A, Ulusoy M. A collapsible partial denture for a patient with limited mouth opening induced by scleroderma: A clinical report. *J Prosthodont* 2015;24(4):334-338.
9. Sinavarat P, Anunmana C. Sectional collapsible complete removable dental prosthesis for a patient with microstomia. *J Prosthet Dent* 2015;114(5):627-632.
10. Yenisey M, Kulunk T, Kurt S, Ural C. A prosthodontic management alternative for scleroderma patients. *J Oral Rehabil* 2005;32(9):696-700.
11. Al-Hadi LA, Abbas H. Treatment of an edentulous patient with surgically induced microstomia: A clinical report. *J Prosthet Dent* 2002;87(4):423-426.
12. Ohkubo C, Watanabe I, Tanaka Y, Hosoi T. Application of cast iron-platinum keeper to a collapsible denture for a patient with constricted oral opening: A clinical report. *J Prosthet Dent* 2003;90(1):6-9.
13. Suzuki Y, Abe M, Hosoi T, Kurtz KS. Sectional collapsed denture for a partially edentulous patient with microstomia: A clinical report. *J Prosthet Dent* 2000;84(3):256-259.
14. Winkler S, Wongthai P, Wazney JT. An improved split-denture technique. *J Prosthet Dent* 1984;51(2):276-279.
15. Geckili O, Cilingir A, Bilgin T. Impression procedures and construction of a sectional denture for a patient with microstomia: A clinical report. *J Prosthet Dent* 2006;96(6):387-390.
16. Benetti R, Zupi A, Toffanin A. Prosthetic rehabilitation for a patient with microstomia: A clinical report. *J Prosthet Dent* 2004;92(4):322-327.
17. Hajimahmoudi M, Mostafavi AS. A simple and effective method for prosthetic rehabilitation in scleroderma patients: A clinical report. *Int J Prosthodont* 2014;27(2):169-173.
18. Colvenkar SS. Sectional impression tray and sectional denture for a microstomia patient. *J Prosthodont* 2010;19(2):161-165.
19. Kanazawa T, Yoshida H, Furuya Y, Shimodaira

- K. Sectional prosthesis with hollow obturator portion made of thin silicone layer over resin frame. *J Oral Rehabil* 2000;27(9):760-764.
20. Wang RR. Sectional prosthesis for total maxillectomy patients: A clinical report. *J Prosthet Dent* 1997;78(3):241-244.
21. Watanabe I, Tanaka Y, Ohkubo C, Miller AW. Application of cast magnetic attachments to sectional complete dentures for a patient with microstomia: A clinical report. *J Prosthet Dent* 2002;88(6):573-577.

**Corresponding Author:****Tamer ÇELAKIL**

Department of Prosthodontics

Faculty of Dentistry Istanbul University

34093, Çapa-Fatih-İstanbul/Turkey

Phone: +90 212 414 20 20 (ext:30264)

e-mail: tamer.celakil@istanbul.edu.tr