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Magnet-retained sectional definitive obturator for an infrastructure maxillectomy patient with limited jaw opening: A clinical report

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ABSTRACT

A limited oral opening can be a significant problem for patients who must wear removable dental prostheses while inserting or removing prostheses. The treatment of a patient with an infrastructure maxillectomy due to adenoid cystic carcinoma is presented in this clinical report. A sectional obturator prosthesis retained by magnets was fabricated to deal with trismus, fibrosis, and microstomia. The patient's esthetic and functional expectations were satisfied. The new generation of magnets with improved technology provide sufficient denture retention for clinical application. However, further follow-up may be necessary to ascertain the long-term usefulness of the magnet-retained obturator prosthesis, because, not only the deformation of the silicone material may continue to progress but also loss of magnetism can occur because of corrosion.

Key Words: Magnetic attachment, sectional prosthesis, obturator.

INTRODUCTION

Adenoid cystic carcinoma (ACC) develops from gland tissue and is considered rare.[1] The tumor grows slowly, but neural invasion, distant metastases and multiple recurrences are common.[2] ACC accounts for about 10% of all salivary gland neoplasms and 1% of all head and neck malignant tumours.[3] The prognosis of ACC patient, even after surgery and radiation therapy is often less than promising.[4] Due to its slow growth, ACC has a relatively indolent but relentless course. Unlike most carcinomas, most patients with ACC survive for 5 years, only to have tumors recur and progress.The parotid and submandibular glands are the two most common sites for ACC accounting for 55% of the cases. Among the major glands the parotid is the most common site of occurrence. Intraorally 50% of ACCs occur on the palate with other less common sites of involvement including the lower lip, retromolar-tonsillar pillar region, sublingual gland, buccal mucosa, and floor of mouth.[5]

The primary methods of treatment of this kind of head and neck malignancies are surgical resection, radiation therapy, or both. Radiation therapy is calculated to eradicate or shrink a tumor with a precisely measured dose of radiation to a defined tumor volume with minimal damage to surrounding healthy tissue.[6] Radiation therapy has direct, immediate, and late effects and complications. Limited oral opening is a common complication in patients who have undergone head and

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neck radiation. Moreover limitation of movements of the mandible may be seen because of fibrosis of masticatory muscles,[6] facial burns,[7] connective tissue disease,[8] reconstructive lip surgeries, scleroderma, and post-operative head and neck trauma.[9] Having a limited oral opening can be a significant problem for patients who must wear removable dental prostheses while inserting or removing the prostheses. Clinical management of this problem can be achieved by surgery, the use of dynamic opening devices and modification of denture designs.[10] Surgical enlargement must be considered carefully because the patient was exposured the radiotherapy and if the rehabilitation of the surgical operation is not sufficient, a scar may result.[11]

This article describes the prosthodontic management of an infrastructure maxillectomy patient with having a limited oral opening induced by scar formation from surgical resection and radiation therapy.

CLINICAL REPORT

Clinical Findings

A 64 year-old partially edentulous man with a voluminous, asymptomatic swelling on the left hard palate was referred for prosthetic evaluation prior to surgery (Fig 1). The biopsy revealed an adenoid cystic carcinoma. Shortly after the diagnosis, the patient underwent a left infrastructure maxillectomy and an immediate surgical obturator had been placed in the maxillary defect (Aramany's Class I). Seven days post-surgery, the immediate surgical obturator was removed and an interim obturator was constructed and placed for the duration of the wound healing period. The resection bed (surrounding tissues of the surgery region) was treated postoperatively with external-beam radiation therapy to a total dose of 6500 cGy. Fibrosis and scar contraction occurred after surgery and radiotherapy, resulting in a limited oral opening which impeded the ease of insertion/removal of the obturator. Therefore, the bulb portion of the interim obturator had limited dimension into the defect. The interim obturator was used for approximately 12 months. The patient was monitored at 10-day intervals for first 6 months and at 1-month intervals for second 6 months. The interim obturator was evaluated and adjusted during the healing period. Moreover, a fluoride-containing dentifrice (Topex Take Home Care, Sultan Dental Products, Englewood, NJ, USA) was recommended to the patient to avoid occurrence of root caries in the remaining teeth. In addition, a saliva substitute (Salagen, MGI Pharma, Minneapolis, MN, USA) was given to overcome the xerostomia. Unfortunately, xerostomia never improved substantially, and exogenous replacement of saliva was necessary. For the simplest form of replacement, water can be sipped throughout the day and this was recommended to the patient.

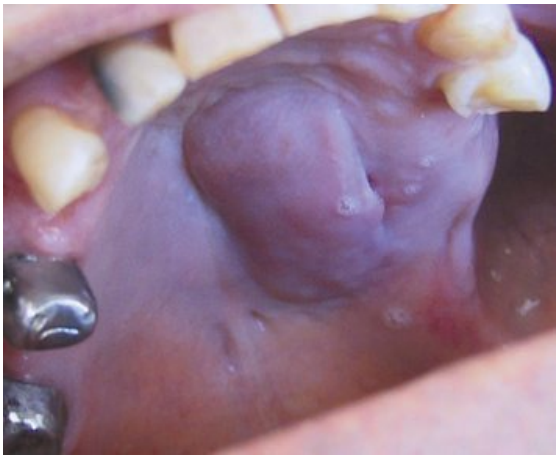

Fig. 1. Intraoral view of tumor in maxilla.

Treatment Plan and Procedures

After 12 months the definite obturator was considered. A clinical examination revealed a partially edentulous maxilla and mandible and Aramany's Class I defect (Fig 2). There was remarkable limitation in the oral opening, and it was difficult to seat a 1-piece obturator to the defect area. Since the patient refused to undergo surgical

enlargement of the mouth aperture, which was discussed as an alternative treatment, the rehabilitation included buccal flange sectional obturator prosthesis and mandibular removable partial denture prosthesis.

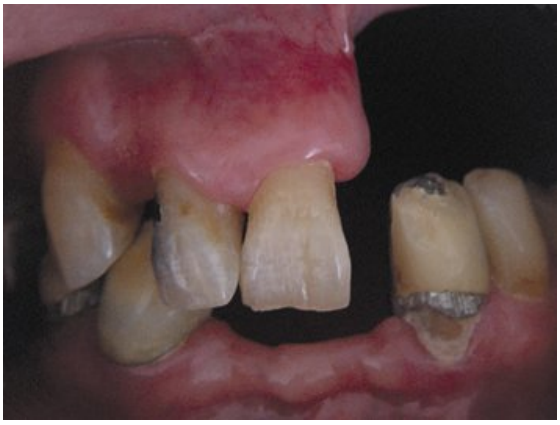

Fig. 2. Frontal view of the patient after surgery and radiotherapy.

A preliminary impression with irreversible hydrocolloid (Cavex CA37, Cavex Holland BV, Haarlem, Holland) was made with the use of stock impression tray for maxilla and with the use of a custom tray for mandible. Maxillary and mandibular impressions then were poured in ADA-type IV dental stone (Anadolu Dental Products, Istanbul, Turkey). These casts were dublicated for the maxillo-mandibular relationship. Afterwards, a hollow bulb was made of autopolymerizing acrylic resin (Entacryl, ENTA B.V, Bergen, Holland) which only seat into the defect area was prepared. Moreover, resected left hard palate was being simulated by this hollow bulb. Stoppers were prepared on the oral surface of this bulb. When hollow bulb was seated into the defect area on cast, an impression with irreversible hydrocolloid was made on this cast for preparing record base. First, hollow frame was seated into the defect and second, record base was checked into the mouth. Afterwards maxillomandibular relationship was recorded with conventional procedures. After periodontal therapy had been completed, the existing crowns on teeth 17, 15, 32, 43 and 44 were removed due to failure of marginal integrity**.** Not only poor oral hygiene but also radiation caries caused this failure. Moreover, wear was observed in the facets of the crowns. For metal-ceramic 5-unit fixed partial denture, teeth 11, 12, 13 and 15 were prepared and final impression was made with the use of a silicon impression material (Siloflex plus, Spofa Dental, Prague, Czech Republic). Also**,** teeth 18, 36, 32, 43 and 44 were treated with a metal-ceramic fixed partial denture. Precision attachments (Vario-stud-snap attachments, Bredent, Witzighausen, Germany) were placed to the mesial side of teeth 11 and distal side of teeth 15. The fixed partial denture and crowns were evaluated intraorally, adjusted, and cemented with glass-ionomer luting cement (GC Fuji I, GC Co, Tokyo, Japan).

Fabrication of a sectional custom tray for the final obturator impression, border molding, and final impression were accomplished according to a previous report.[11] After a mandibular final impression had been made with the use of irreversible hydrocolloid and a cast model was obtained, the master cast was mounted on a semi-adjustable articulator (Hanau Articulator 96H2O, Teledynehanau, Buffalo, NY, USA).

A buccal flange frame then was made of a heat-polymerizing acrylic resin (Meliodent, Bayer Dental, Newburg, Germany). The resin frame was placed on the working cast. The wax relief of the cast was boiled out. After an adhesive (Primo, Detax, Ettingen, Germany) was applied to the outer surface of the frame, soft silicone (Molloplast-B, Primo, Detax, Ettingen, Germany) was applied to the frame using a conventional flasking and compression moulding procedure to complete the buccal flange silicone layer over the resin frame portion of the prosthesis. This silicone layer gives the obturator portion flexibility, thus, it was easily seat into the undercuts within the defect. The thickness of the

silicone layer was approximately 3 mm. After placing the obturator portion in the master cast, an impression was taken to make the denture portion.

The maxillary and mandibular frameworks were fabricated and evaluated intraorally to ensure proper fit. The accuracy of the frameworks was verified, artificial teeth were conventionally arranged, and the dentures were completed conventionally. Pairs of magnets (Hilop 4513, Hitachi Metals, Tokyo, Japan) were affixed with self-curing acrylic resin at the corners of the obturator (one of them buccal corner and the other one posterior corner) and denture portions to complete the magnet-retained buccal flange sectional obturator prosthesis (Fig 3 through 6). These rare earth magnets, Neodymium-Iron-Boron (Nd-Fe-B), have 4.5 mm diameter and 1.3 mm height. Before delivery, the silicone surface was covered with a silicone based gloss varnish (Lustrol, Detax, Ettingen, Germany).

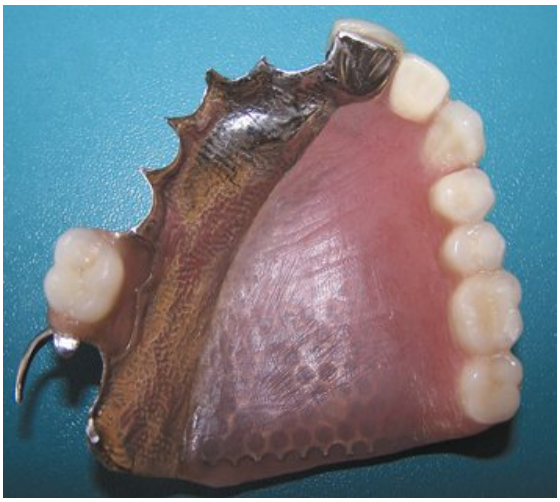

Fig. 3A. Denture portion of the sectional obturator prosthesis.

After adjustment of the obturator segment, the patient was monitored at 3-month intervals for 4 years. His maxillary right second molar was lost 16 months as a result of the loss of alveolar bone support. Therefore, the missing area was replaced with the same kind of artificial right

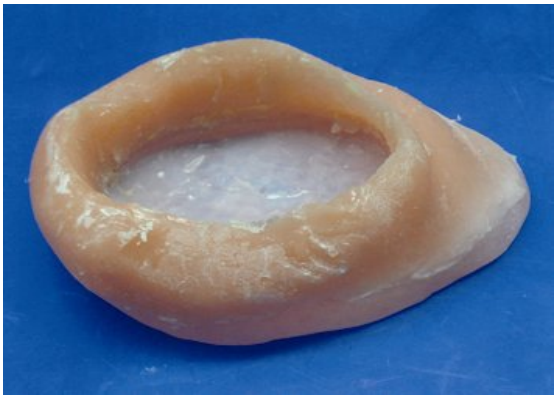

Fig. 3B. Buccal flange obturator portion with silicon liner.

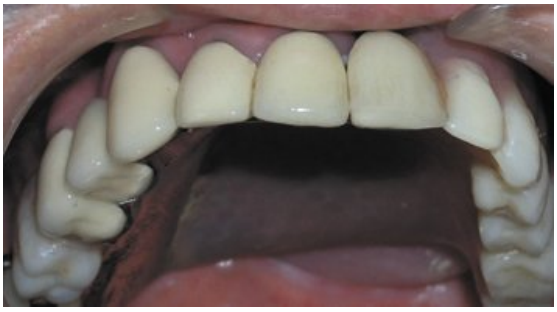

Fig. 4. Occlusal view of maxillary buccal flange obturator prosthesis.

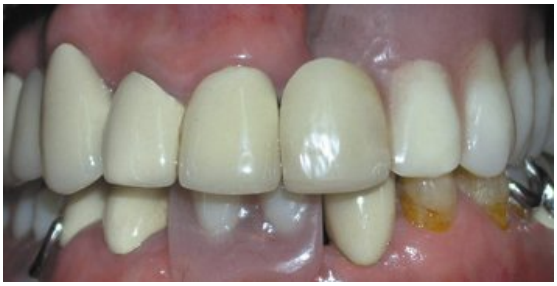

Fig. 5. Frontal view of the patient with sectional obturator prosthesis.

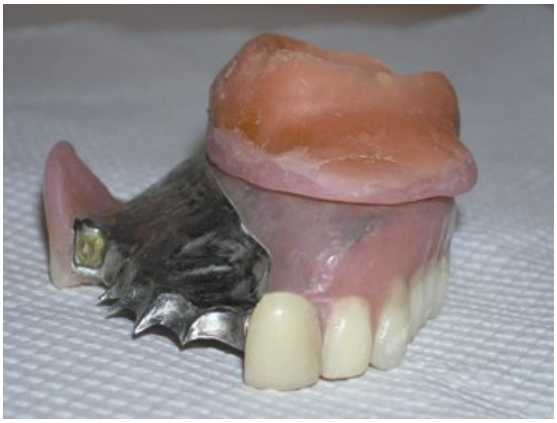

Fig. 6. Assembly of the sectional magnetically retained prosthesis.

second molar as in the original prosthesis, (same material, same shade and same mould) and it was bonded with the autopolymerizing acrylic resin. Placement of the obturator prosthesis provided remarkable improvement in speech. The prosthesis remained intact, with no corrosion, wear or fracture, and the patient expressed satisfaction with both appearance and function.

DISCUSSION

Unlike conventional prostheses, a number of additional factors should be taken into consideration in the fabrication of sectional intraoral maxillofacial prostheses, such as the impression method, materials to be used in laboratory procedures, design of sectional parts if the prosthesis is a sectional one, method of connection, direction of insertion and removal, esthetic factors, and maintenance program.[12,13] The patient in this clinical report had an infrastructure maxillectomy defect and the resection bed was treated postoperatively with external-beam radiation therapy. This resulted in limited oral opening and insertion of one-pieced obturator prosthesis was not possible. Thus, the treatment option included the use of magnet-retained sectional buccal flange obturator.

Oral et al.[13] reported that buccal flange obturators showed statistically significant superiority to hollow obturators as the preferred condition in live and tape-recorded evaluation of speech. Providing improvement in speech was one of the priorities of the patient. Moreover, magnet-retained sectional buccal flange obturator prosthesis is beneficial to patients, because it permits easy insertion and removal and its weight is minimized.[14]

On the other hand, if one side of the assembly is lost, as in the case in an infrastructure maxillectomy, there is no longer resistance to dislodgment rotationally around the retentive clasp tip. Additional retentive clasps on the nondefect side will not be effective in the resisting the tendency for rotational dislodgment. The only effective method available to counteract this rotational tendency is to create guide planes on the sides of the teeth facing the obturator, in this case the palatal surface. Parallel guide planes have been incorporated into metal-ceramic crowns.[15]

The obturator portion is made of resilient silicone material that appropriately engages undercuts within the defects, which can't be used by a rigid obturator, thus providing retention, support, and stability of the prosthesis.[14] However, a silicone obturator has limitations, such as relatively heavy weight, deformation during mastication, and susceptibility to monilial infection.[16] To reduce the weight and prevent deformation, an obturator portion composed of a thin silicone liner an acrylic resin frame was fabricated. Also, a silicone based gloss varnish was applied to the surface of the silicone to alleviate the roughness and susceptibility to fungal contamination that could limit its useful life.[14]

No visible wear was observed in the magnetic system, which may be due to improved corrosion resistance of the Hilop system. Also, this type of magnet system has some additional advantages over other systems. Attractive force of this system is 880 gr more than others. Today this force improved 1200 gr. Moreover, it is easier to provide this magnetic system when we compare the other ones.

On the other hand, the patient was impatient during treatment period because of the nature of his disease. Also, he demanded to shorten the period of the using interim obturator. His expectation was to shorten treatment period from us. He expressed that long life prosthesis was not important for him. However, we should take into consideration the patient's comfort after that time. First of all, we persuaded the patient interim obturator

period and definite obturator procedures and then definite obturator prosthesis was prepared as far as possible short time.

Because the patient was diagnosed for an adenoid cystic carcinoma, follow-up appointments for both oral health status and prosthesis function are as important as the treatment itself, and they are regularly conducted.

CONCLUSIONS

This clinical report described magnet-retained sectional buccal flange obturator prosthesis for a patient with an infrastructure maxillectomy defect. It was successfully and easily inserted and has functioned very well for 4 years. No visible fracture or wear or deformation has been encountered with the silicone obturator prosthesis.

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