Case Report

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Dentistry Section

Magnet and Semi Precision Attachment in an Implant Retained Partial Denture for the Rehabilitation of an Irradiated Marginal Mandibulectomy Patient: A Case Report

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ABSTRACT

Surgical treatment of malignancies in the oral cavity (mandible, tongue, floor of the mouth, alveolus, buccal sulcus) often results in an unfavourable anatomic condition for prosthodontic rehabilitation. Hence, maxillofacial prosthetic rehabilitation becomes a mightier task when resection is accompanied by radiation therapy. In selected cases, implant therapy comes to rescue. The following report throws light on the case of prosthetic rehabilitation of a patient who underwent right marginal mandibulectomy and right partial glossectomy, with the aid of a single implant, semi precision attachment and magnet supported partial denture.

Keywords: Glossectomy, Radiation therapy

CASE REPORT

Diagnosis and treatment planning

A 46-year-old patient who reported to the B.R Patil Cancer hospital, Navanagar, Dharwad was diagnosed with squamous cell carcinoma of the mandible not involving the inferior border, tongue and floor of the mouth on the right side. Teeth in the involved site were extracted prior to radiotherapy. Patient was subjected to radiation dose of 35Gy. Surgical intervention comprised of marginal resection from right lateral incisor to right second molar region with primary closure. Partial glossectomy and radical neck dissection on the right side were performed.

The patient was on follow up care for two years after which he reported to our Department of Maxillofacial Prosthodontics. On intraoral examination, mouth opening was reduced with very minimal jaw deviation toward the resected site. Scarring and vestibular obliteration both on buccal and lingual aspects were observed and available bone height for prosthesis placement was reduced.

The upper and lower arches presented a Kennedy class II situation with posterior edentulous area on the right side [Table/Fig-1]. The vertical dimension of the face was maintained by the full complement of teeth in the left upper and lower arches except for missing 34, served as a vertical stop. The case presented marked xerostomia and loss of clarity of speech due to partial glossectomy. As a result of trauma, 31 and 41 presented reduced coronal tooth structure.

The patient was introduced to a variety of treatment options available but based on the compliance and economic status of the patient a suitable treatment option was chosen.

The prosthodontic rehabilitation comprised of an attachment retained partial denture for the maxillary arch and an implant, attachment and magnet retained partial denture for the mandibular arch. Radiographic evaluation comprised of Digital Visuography and Orthopantomograph. Diagnostic impressions were made and casts were fabricated. Jaw relation was recorded.

Implant placement

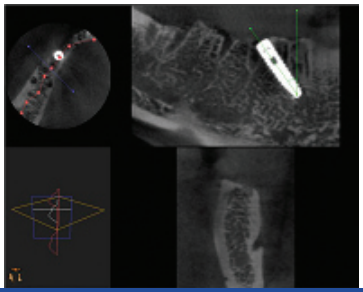
Following radiographic bone evaluation, a single dental implant (MIS; Israel) of length 4.2x16mm, was placed at a distal angulation of 15 degrees with respect to 41 region [Table/Fig-2]. As the patient had been subjected to radiation therapy, the site of implant placement was chosen meticulously to avoid the zone of radiation beam entry into the bone. The angled implant allowed improved load distribution. Following implant surgery, healing abutment was placed and the patient was on frequent follow up for 6 months.

Impression Procedure

Post healing period and radiographic bone implant evaluation, the impression procedure was carried out. An impression post was threaded on to the implant for making an open tray impression. The post space was prepared with respect to 31 and 41 for the fabrication of splinted copings. Orthodontic wires were used for pickup impressions of the post spaces [Table/Fig-3]. The open tray impression served as a pick up for both the lab analogues and the wire posts [Table/Fig-4]. A working cast was thus obtained.

Lab procedure

An angled plastic castable cylinder (MIS, Germany) was threaded on to the implant analog. Using added inlay wax, the plastic castable was shaped to resemble a molar. A castable attachment



[Table/Fig-1]: Maxillary and Mandibular partial edentulous arches with mandible showing ridge resection **[Table/Fig-2]:** Implant placed in titled position to get more posterior support for the prosthesis **[Table/Fig-3]:** Root canal impressions of tooth no 31 and 41

[Table/Fig-4]: Open tray impression post placed and the final impression picked up with root post impressions **[Table/Fig-5]:** Castable abutment placed and magnetic keeper wax up done. Ceka sagix attachment attached to the castable abutment **[Table/Fig-6]:** Shows final placement of cast implant crown with sagix attachment and cementation of the magnetic keeper post on 31 and 41

[Table/Fig-7]: Trial prosthesis **[Table/Fig-8]:** Placement of final prosthesis

(Preci-Sagix; ceka attachments Belgium) was affixed on to the mesial aspect of the inlay pattern. Splinted inlay wax copings were fabricated with respect to 31 and 41. At their junction, the copings housed a single magnet keeper (Magfit DX 600; Aichi Steel Corp, Japan) [Table/Fig-5]. The wax patterns were cast.

Cementation

The resulting screw retained cast abutment with attachment was threaded onto the implant and allowed to heal. The opening of the screw channel was blocked with a piece of cotton and adhesive resin cement (Rely X U200; 3M ESPE, Germany). The splinted copings with the keeper were cemented over the prepared teeth using resin cement [Table/Fig-6].

Eleven received a porcelain fused to metal crown with an attachment (1.7mm, mini Preci-Sagix, Belgium) on the distal aspect.

Denture fabrication

The metal housings for the attachments were cast separately using light cured pattern wax (Liwa Flow; W+P Dental, Germany). Pick up impressions were recorded for both upper and lower arches that harbored the metal housings. Casts were fabricated. Trial dentures were evaluated [Table/Fig-7]. An attachment retained partial denture was hence fabricated for the upper arch.

The lower acrylic partial denture framework was also fabricated and the counter magnet was picked up in the denture using self polymerizing acrylic resin [Table/Fig-8].

DISCUSSION

Surgical resection results in impairment in salivary secretion, speech, mastication, swallowing, impaired function of the tongue, a severe reduction of the neutral zone and a very poor load-bearing capacity of the remaining soft tissues and mandibular bone. Many of these problems can, at least in part, be diminished by the use of endosseous oral implants [1-3].

These problems are worsened if the sensibility in the defected region is lost affecting speech and mobility of oral tissues [4-7]. An implant-supported prosthetic construction diminishes pain and may thus enhance the ability to regain essential functions such as speech, chewing and swallowing. The consequences of radiation on osseointegration have been reported to depend on the site of implant placement, the dose and fractionation of radiotherapy [8]. Hence, doses over 40–50 Gy are thought to significantly impair the healing capacity of the bone and also resulting in inherent increase of the risk of complications when performing surgery [9,10].

In this case the use of hyperbaric oxygen therapy was not mandatory as the patient was exposed to radiation dose of 35Gy [11]. Following implant therapy in irradiated mandible, a waiting period of 4-6 months is advised before the abutment connection to enable the implants for additional time for osseointegration [8,12].

Due to heavy scarring, vestibular obliteration and limited bone available, the implant was strategically placed at a 15 degree distal angulation. In a finite element analysis conducted by Saab et al., on the effect of abutment angulation on the strain on the bone around an implant in the anterior maxilla, it was concluded that 15% higher maximum bone strain was observed for the straight abutment as compared with the angled abutment [13]. The abutment was maintained at infra-occlusion as compared to the adjacent teeth in the acrylic framework in order to reduce stress.

According to the World Health Organization a functional, aesthetic, natural dentition must have at least 20 teeth, while the literature indicates that dental arches comprising the anterior and premolar regions can sufficiently cater to the requirements of a functional dentition. Few authors suggested that maintenance of oral function in shortened dental arches is achievable provided at least 4 occlusal units remain, and are symmetrically placed [14].

A few teeth, or even roots, can make the difference between success and failure. Instead of extraction and added trauma to the tissues, the splinted copings allowed the otherwise slender incisors to not only be salvaged but be effectively used to provide a stable prosthesis with the aid of magnets.

In occlusion, the prosthesis also served a guidance prosthesis which prevented the deviation of the mandible to the resected site due to heavy scarring and vestibular obliteration. As per the request of the patient who expressed his displeasure in accepting a metal denture framework, an acrylic partial denture was fabricated. Literatures in the past have described the use of guide flange prosthesis for retraining the compromised mandible. Maxillary inclined plane prosthesis has been advocated for use in cases of dentate mandibulectomy cases. A variety of prosthesis designs including removable silver flange splints to prevent mandibular displacement, creation of a pseudo temporomandibular joint with the help of split tubes attached to the upper teeth for patient with unilateral mandibular resection, special clasp designs like the “gate clasp” which incorporates two continuous clasps positioned below their height of contour on the buccal and lingual surfaces for added retention of the prosthesis, modified obturators, hinged assemblies embedded in the lower denture, continuous hinge clasps, and a variety of cast partial denture designs including the “swing- lock”

removable partial dentures have been put forth. Tube sleeve connectors and rigid retainers with trombone arm stress breakers were amongst few other designs. However, there is scarcity in the information about use of implants to rehabilitate a dentate resected mandible. Although Implant retained overdentures are commonly constructed for edentulous mandibulectomy patients [1,9,15,16].

Although the meticulous preservation of the bone and salvaged tooth structure after resection, using implant and attachments is what this clinical report throws light upon.

CONCLUSION

This clinical approach has described an innovative and unique outlook towards the prosthetic management of a marginal mandibulectomy patient with the use of an implant with attachments and a magnetic assembly to aid in a retentive, stable and aesthetically acceptable prosthesis. The lack of data in literature pertaining to the definitive treatment rendered to such patients makes this particular approach to rehabilitation, one of its kind.

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