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Case Report

Management of Edentulous Hemimandibulectomy Patient with Implant Retained Overdenture- A Case Report

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ABSTRACT

Segmental hemimandibulectomy is the partial resection of the mandible owing to oral neoplasms. This causes deviation of the remaining mandible segment towards the resected side and loss of continuity. Prosthetic rehabilitation plays a vital role in such cases. The case report discussed in this article was a case of segmental hemimandibulectomy which had been rehabilitated with the use of three osseointegrated implants in the remaining bone site. An overdenture was supported on the implants with ball attachments. This case report presents an alternate way to rehabilitate a patient with partial mandibular resection when surgical reconstruction is not possible.

Introduction

Oral and pharyngeal cancers are the sixth most common tumour in the world. The most common type is squamous cell carcinoma[1]. Surgical resection of oral tumours is the most common treatment modality to eliminate and prevent the recurrence of the tumour [2]. Mandible is the most common site for oral cancer and its rehabilitation is challenging. The degree of functional disability and cosmetic disfigurement is dependent on the location of the tumour and the extent of surgical resection. Speech impairment is seen. The motor and sensory control of the lower lip is often compromised by resection of the marginal mandibular and inferior alveolar nerves. Postoperative scarring may also impact lip function. During mastication, the entire envelope of motion occurs on the surgical defect side. In patients whose mandibular continuity has not been restored, loss of the proprioception sense of occlusion leads to uncoordinated, imprecise movements of the mandible. This causes frontal rotation and also because of the absence of attachment of the muscles of mastication on the surgical side, there is significant rotation of the mandible upon forceful closure. The mandibular teeth often occlude distal to the presurgical pattern of cuspal interdigitation. On the nonsurgical side, the buccal slopes of the mandibular buccal cusps function with the central fossae of the maxillary teeth because of mandibular rotation in the frontal plane. Control of saliva is

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profoundly affected by most resections of the tongue and mandible. Drooling is compounded on the defect side by the drooping of the corner of the mouth. Cracking and large fissures develop and these may become infected with candida albicans. The angular pathway of mandibular closure induces lateral forces that tend to dislodge the dentures. The abnormal profile and position of the mandible in relation to the maxilla may prevent ideal placement of the denture teeth over their supporting structures[1]. Mandibular resections extending to the midline have a poor prosthetic prognosis. Conventional methods of prosthetic rehabilitation rely solely on remaining teeth and tissue for support, retention, and stability, thereby limiting functional benefits[3][4]. In almost all patients, placement of the osseointegrated implants in the residual anterior mandible, reconstruction of the mandible with a bone graft, or both, enables function with dentures[1]. The use of implants has revolutionized and brought a ray of hope for attempting rehabilitation post mandibular resection[5].This case report is an innovative approach for rehabilitating segmental hemimandibulectomy case without reconstruction by placing implants with ball attachments to meet the requirements of the patient.

Clinical Report

A 68 year-old male patient reported to the Department of Prosthodontics, with the chief complaint of difficulty in chewing food due to deviation of lower jaw[Figure 1]. The patient had a history of segmental hemimandibulectomy of right side 15 years back due to carcinoma of right buccal mucosa. The clinical examination revealed resected mandible upto first premolar region of right side which was categorized as Cantor and Curtis type II resection defect [6]. Intra-orally, teeth number 34, 35 and root stumps of 36, 38 were present and the maxillary arch was rehabilitated with fixed prosthesis eight years back[Figure 2]. The radiographic examination showed a unilateral discontinuous mandibular defect on the right side [Figure 3]. The mandible was deviating towards the resected side. Medical records of the patient revealed no systemic disorders.

The available treatment options were conventional removable prosthesis, implant overdenture, guiding flange prosthesis and implant supported fixed prosthesis. Since patient could not afford fixed denture treatment, so, implant retained overdenture by using bar superstructure with ball attachments was planned. The treatment plan was explained to the patient and an informed consent was obtained.

i) Surgical phase:

Cone beam computed tomography was done to plan the implant site position [Figure 4]. Stage I surgery was performed by placing 3 Dentium implants (Dentium implant system, Korea) of dimension 4.3x9 mm in 32, 34 and 5x9 mm in 41 region. Immediate implant was placed in 34 region. Extractions of 35 and root stumps of 36, 38 were done. Primary closure was obtained and the implants were allowed to osseointegrate for 4 months [Figure 5, 6].

ii) Prosthetic phase:

Stage II surgery was performed after 4 months and gingival formers were placed [Figure 7]. Diagnostic jaw relation was recorded to determine the interarch distance which was found to be 17 mm. According to the guidelines proposed for selection of implant prosthesis, implant retained overdenture was chosen as the suitable treatment option[7][Table 1]. Open tray impression was made using custom acrylic tray, 15 days after second stage. The copings were splinted using dental floss and

pattern resin material to avoid their movement while making the impression [Figure 8]. The impression was made by using addition silicone putty and light body material and poured in type IV die stone [Figure 9,10]. Jig trial was verified on cast as well as intraorally [Figure 11]. Jaw relation record was made using cold cure acrylic denture base and wax rim. There was severe overjet anteriorly of approximately 12-14 mm. The jaw relation was recorded in centric relation position [Figure 12]. Lingualized occlusal scheme on the right side and maximum intercuspation on the left side were given. Try-in was carried out [Figure 13]. After try-in, pattern for bar superstructure with ball attachments was designed using exo cad software and then fabricated.. Then the framework was verified for passive fitting clinically and radiographically [Figure 14]. After verification of framework, the trial denture was processed into heat cure denture with attachments incorporated on tissue surface of the denture for ball attachment. The attachments were made of nylon material. During denture insertion, the fitting and occlusion was checked and refined for processing errors. The patient was taught about insertion, removal of prosthesis and advised about intraoral hygiene maintenance [Figure 15(a-c), 16]. The patient was recalled after 3 days, one month and then 3 months.

Discussion

Hemimandibulectomy of the right side was performed 15 years back without reconstruction. There are various classification systems. The defect in the present case has been classified according to the classification systems. [8-13][Table 2]. Treatment with implant-supported prostheses has been described for oral cancer patients[14]. QoL (Quality of Life) and DSI (Denture Satisfaction Index) of implant-supported removable

INTER-ARCH DISTANCE	PROSTHETIC OPTIONS
10-12 mm	Fixed Porcelain fused to metal prosthesis/ layered zirconia, screw or cement retained.
12-15 mm	Fixed Porcelain fused to metal prosthesis/ layered zirconia with pink porcelain, screw or cement retained. Removable Implant retained overdenture with locator attachments
15-18 mm	Fixed Hybrid prosthesis (metal framework with acrylic resin) Hybrid prosthesis with biocompatible high performance polymer Combination bridge (screw retained framework with small units of cement retained crowns) Removable Overdenture with ball attachments
More than 18 mm	Removable Overdenture retained by casted or milled bar or Telescopic attachments

Table 1: Prosthetic options according to interarch distance in completely edentulous patients [7]

overdentures when compared to conventional (non-implant-supported) prostheses were significantly improved[15]. Osseointegrated dental implants have a high level of evidence to support their use in "nonreconstructed patients[5].Fixed prosthesis would had been appropriate; however, implant supported overdenture (RP-5) was the most suitable option according to patient's economic conditions. So to enhance stability of the prosthesis, bar superstructure with ball attachment were used. Meijer et al. using three-dimensional finite-element analysis, concluded that there was no reduction of the principal stresses in bone when the occlusal load was distributed over an increasing number of implants[16]. The implants act as a fulcrum with 2 potential lever arms: (1) From the fulcrum to the posterior extension of the denture and (2) from the fulcrum anteriorly to the incisal edge. Forces on either lever arm will produce rotation. In conventional mandibular edentulous situation, an overdenture

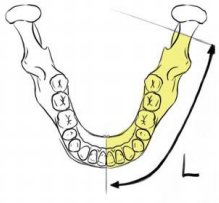
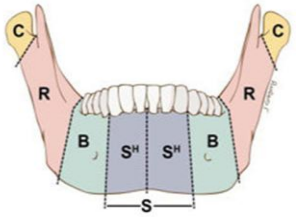
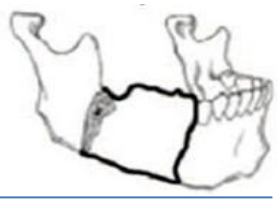
1974	**PAVLAV - CLASS 1**	
1989	**HCL- L** **BOYD'S MODIFICATION OF HCL- Lm**	
1991	**URKEN** **BONE DEFECT- RB^m** **SOFT TISSUE DEFECT- LFOM** **NEUROLOGIC DEFECT- NIA NL**	
2015	**Schultz- type 1** **Unilateral dentoalveolus**	
	Cordeiro- Type IIIB	
2016	**New classification proposed by James Brown et al Class 1**	

Table 2: Schematic representation of the classification of the present case defect according to various classification systems for mandibular defect[8][9][10][11][12][13]

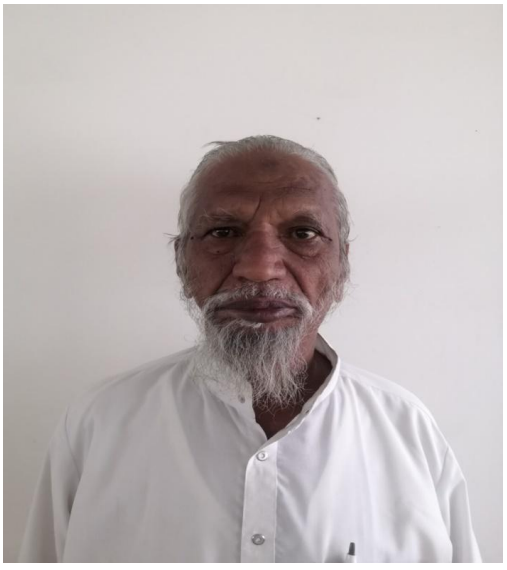


FIGURE 1: PRE-OPERATIVE EXTRA-ORAL VIEW

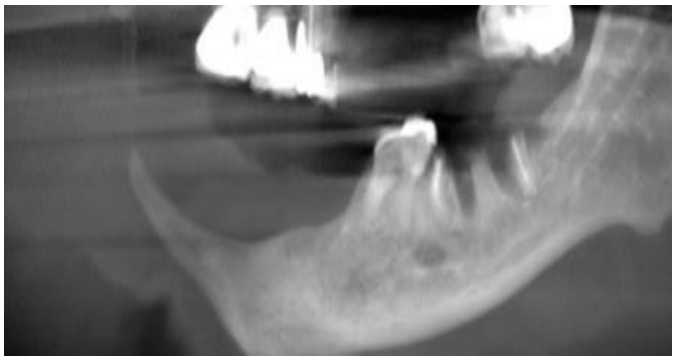


FIGURE 3: RADIOGRAPHIC VIEW

FIGURE 2: PRE-OPERATIVE INTRAORAL VIEW

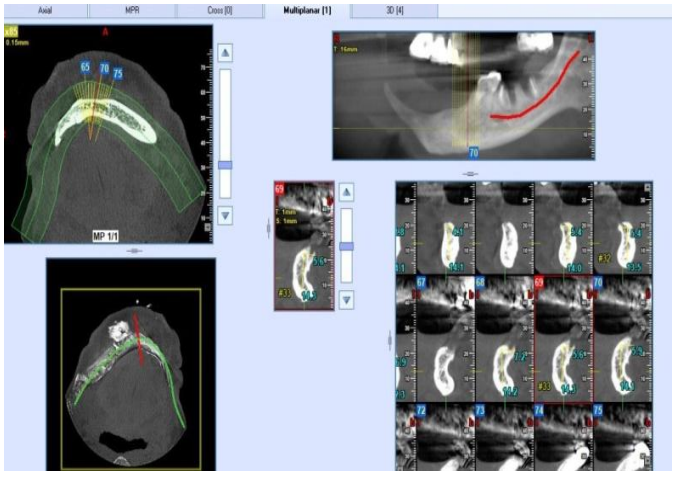


FIGURE 4: CBCT FOR IMPLANT PLACEMENT

FIGURE 5: IMPLANT PLACEMENT

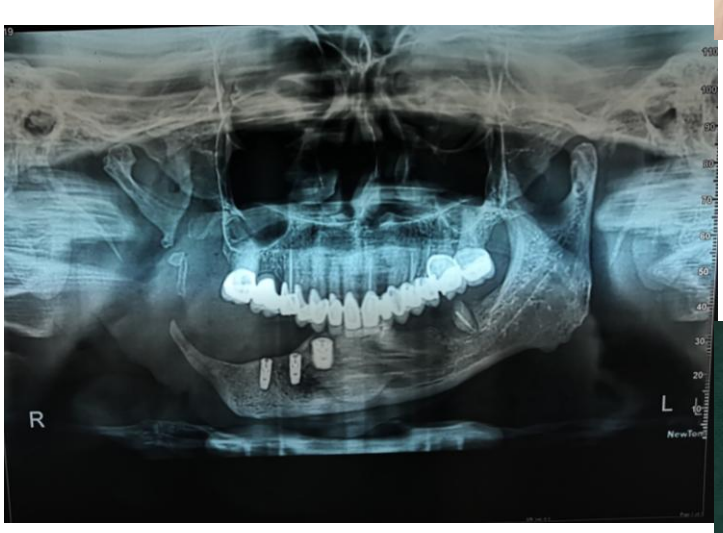


FIGURE 6: RADIOGRAPHIC VIEW POST IMPLANT PLACEMENT

FIGURE 7: SECOND STAGE AFTER FOUR MONTHS OF OSSEOINTEGRATION

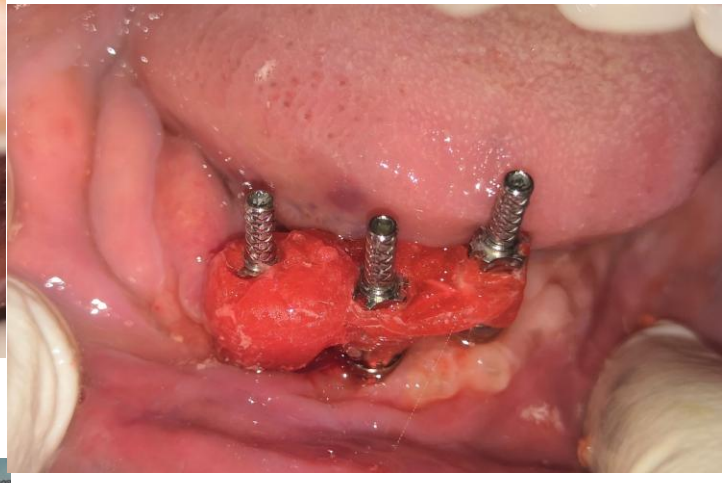


FIGURE 8: SPLINTING OF IMPRESSION COPINGS WITH PATTERN RESIN

Figure 9: OPEN TRAY IMPRESSION WITH ADDITION SILICONE

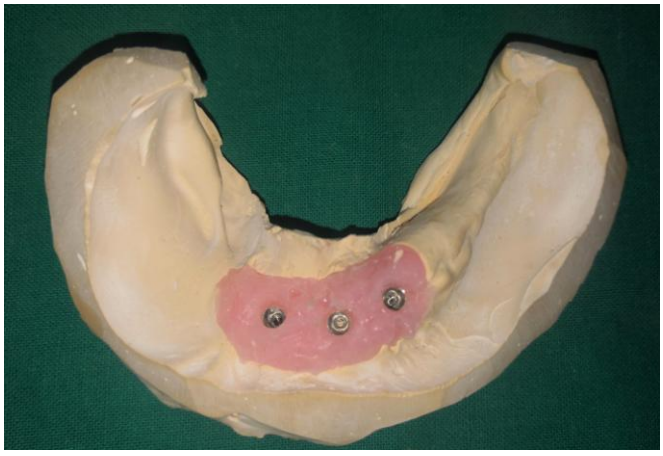


Figure 10: MASTER CAST

FIGURE 12: JAW RELATION RECORDED

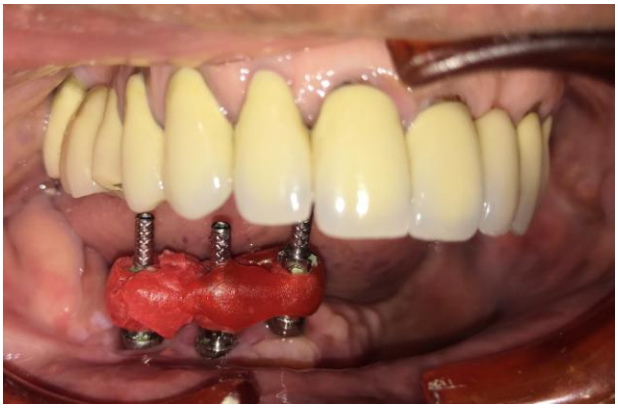


FIGURE 11: VERIFICATION BY JIG TRIAL

FIGURE 13: TRY-IN OF TEETH ARRANGEMENT. MAXIMUM INTERCUSPATION ON LEFT SIDE AND LINGUALIZED OCCLUSION ON RIGHT SIDE.

FIGURE 14: VERIFICATION OF FRAMEWORK INTRA-ORALLY

FIGURE 15: FINAL PROSTHESIS INTRA-ORAL VIEW (FRONT)

FIGURE 15 (a): RIGHT LATERAL VIEW

FIGURE 15(b): LEFT LATERAL VIEW

FIGURE 15(c): DENTURE ENCASING FEMALE SOCKET

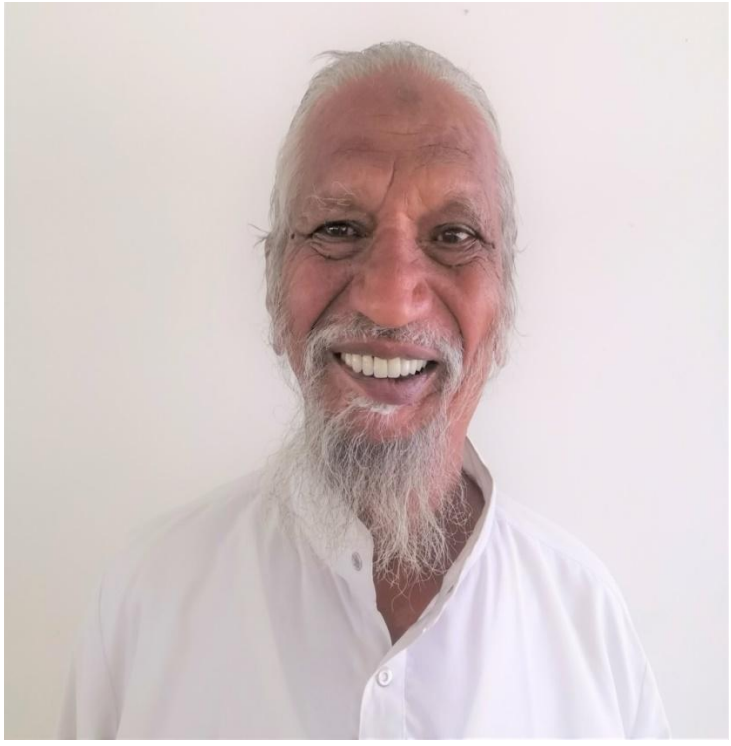
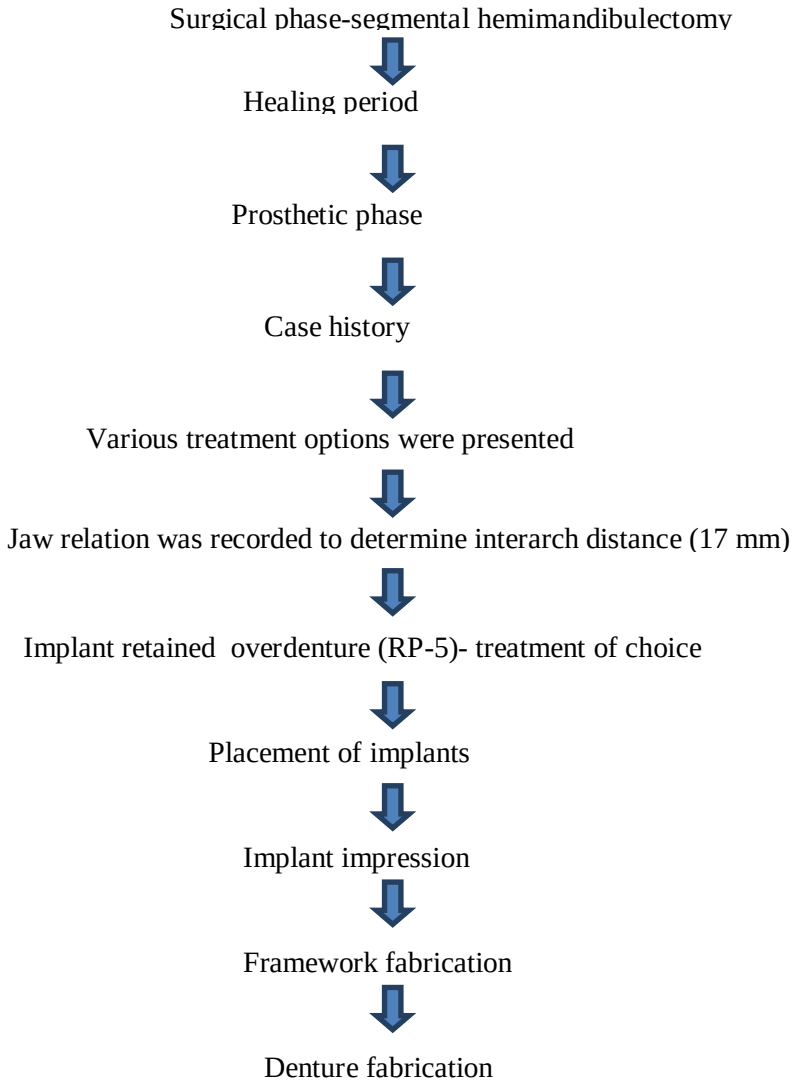


FIGURE 16: POST-OPERATIVE EXTRA-ORAL VIEW

supported with 2 implants splinted with bar superstructure receives some amount of support from posterior ridges. However, in this situation, support from posterior ridge was limited due to hemimandibulectomy. So, adding third implant reduced the posterior lever arm, thereby minimizing rotational movements. Three implants also provided tripod effect and along with bar superstructure were helpful to achieve adequate stability for the compromised bone support. Celik and Uludag in their study have reported that more stress was observed in the solitary type than in the bar splinting type in overdentures with three mandibular implants[17]. Attachment retained prosthesis is valuable because of the stress breaking effect[18]. Guide flange prosthesis is designed for the patient who is able to achieve an appropriate mediolateral position of the mandible but is unable to repeat this position consistently for adequate mastication[19]. In this case, the patient could guide the lower jaw in mediolateral position consistently without any assistance. Lingualized occlusion was given on the resected (right) side to limit the amount of stress and for its better distribution[20]. The occlusal table was kept narrow to reduce faciolingual tipping and the occlusion was adjusted to provide more centric contacts. There was considerable change in the speech and esthetics of the patient. Postoperative mucosal examination was also easier to perform.



FLOW CHART FOR TREATMENT PLAN

Summary

- Atmost utilization of what remains and delivering a prosthesis which will suffice the demands is challenging to the prosthodontic team.
- The purpose of implants is to assist in primary retention of the denture and to help stabilize the denture.
- So, implant supported/retained prosthesis can be considered as a viable option for rehabilitating oral cancer patients.

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