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This article mainly describes the fundamental designing technique in improving the retention, stability and support of the definitive prosthesis with cast retainers.

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Definitive Obturator for Class IV Maxillary Defect with Cast Retainers- A Case Report

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Abstract- Retention, stability & support are three important factors which determine the basic objectives, success and comfort of any removable prosthesis. In acquired surgical maxillary defects; the degree of impairment, size and location of the defect influences the outcome of the overall prosthetic overhaul. Prosthetic therapy with obturator closes the defect by re-establishing the oro-nasal separation, thereby, improving deglutition, speech and hypernasality. After maxillectomy, 3-6 months after surgery, patients with class 4 maxillary defects complains of frequent loosening of temporary prosthesis due to more amount of tissue changes, dimensional stabilization of surgical site, more loss of mucogingival support and rapid healing changes. As a result, there is an every chance of endangerment with the use of temporary prosthesis and allow the patients in seeking the definitive prosthesis over interim prosthesis. In this regard, designing of cast partial metal frame work with linear configuration for class 4 maxillary defects enhances the quality and comfort of the definitive prosthesis over conventional acrylic prosthesis.

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I. Introduction

Re-construction and Re-establishment of acquired surgical defects through 'obturator' is the suggested treatment of choice over surgical approach due to its ease of maintenance and ease of fabrication.[1] According to glossary of prosthodontics terms, obturator is "a maxillofacial prosthesis used to close a congenital or acquired tissue opening, primarily of the hard palate and/or contiguous alveolar/soft tissue structures.'[2] These prosthesis helps in improvement of speech & mastication; reduces hyper nasal speech; prevents the entry of fluids into nasal cavity which are debilitated during maxillectomy. Among different classes of Armany's maxillary defects, class 4 is a peculiar defect which requires special attention in fabrication of a definitive prosthesis. Factors such as size, location of the defect, more amount of tissue damage, more loss of mucogingival support, presence of few remaining teeth for support will jeopardize the effectiveness of the immediately fabricated temporary prosthesis and exasperate the need of permanent prosthesis for these defects[3,4]. Any definitive prosthesis fabricated should be light in weight, has good retention, support and stability compared to interim prosthesis[5]. Even though fabrication of definitive obturator with cast retainers is tedious and cumbersome over conventional heat cure acrylic prosthesis; designing the cast metal frame work with linear configuration for class 4 defects increases the success rate and outcome of the final prosthesis with enhancement of good retention, support and stability. Similarly there were many techniques described in the literature to reduce the weight of the final prosthesis there by keeping the final obturator with either open or closed hollow bulb prosthesis [6-9].

This article mainly focuses on the importance of linear configuration design for class 4 maxillary defects in increasing the retention, stability and support of the definitive prosthesis.

II. Case Report

A 42 years old male patient with a chief complaint of difficulty in chewing, speech and frequent loosening of the temporary prosthesis was referred to department of Prosthodontics, Narayana Dental College and Hospital, Nellore. On history taking, patient has undergone hemi maxillectomy due to chronic suppurative osteomyelitis on left side of maxilla. Medical history revealed that he was on medication for non-insulin dependent diabetes mellitus for the last three years. On Intraoral clinical examination, the surgical sites included are left maxilla, left buccal sulcus area, hard palate on the left side up to the midline, entire premaxilla and anterior part of right maxilla. All teeth in the 2nd quadrant were removed and only four teeth (i.e., 15, 16, 17 and 18) are present in 1st quadrant (Fig. 1). Moreover, presence of healthy surgical sites, caries-free

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teeth was noticed in remaining maxillary and mandibular dentition. Extra oral examination revealed reduced 'vertical dimension of the face, facial asymmetry due to depression in left malar prominence, hollow cheeks, unsupported lips and diminished nasal speech.

According to the Armany's classification (1978) of post maxillectomy defects, this maxillary defect was categorized as class IV maxillary defect since it crosses the midline involving both sides of maxilla with few teeth remaining in a straight line.[10,11]

Based on the above findings, treatment was planned as definitive obturator and the procedure was as follows:

1. Primary impression was made with irreversible hydrocolloid impression material (Zelgan; Dentsply, India) by packing the defect with gauge (Fig. 2). Following this Primary cast was poured with type III gypsum product and a custom tray was fabricated with self cure acrylic resin. (Fig. 3)
2. Mouth preparation for remaining teeth present in the oral cavity was completed in the subsequent appointment. Peripheral tracing was done to record accurate border extensions and the final impression was made with light body impression material (Aquasil LV, Dentsply, India); master cast was then poured with type 4 gypsum product. (Fig. 4, 5)
3. After surveying of the master cast, procedures such as; wax block out of master cast; Master cast duplication with Agar (Castogel, Bego, Germany); Pouring of refractory cast with phosphate bonded investment material; baking of refractory cast; was performed. [Fig. 6]
4. Designing of linear configuration wax pattern for class 4 maxillary defects on refractory cast with incorporation of occlusal rests, direct retainers, indirect retainers, major & minor connectors work was completed on refractory cast. [Fig. 7]
5. Burnout & casting was completed following standard temperatures. Casting was retrieved and after finishing and polishing, the cast metal framework of obturator was checked introrally for proper fitting. (Fig. 8, 9)
6. An occlusal rim was fabricated on the metal obturator; proper jaw relations were recorded; try-in with monoplane dentition was then performed. (Fig. 10)
7. Flasking, Dewaxing was completed and the defect was filled with table salt during packing of heat cure acrylic resin. After curing, prosthesis was retrieved and table salt was poured out to obtain hollow bulb obturator .Proper finishing & polishing was done. (Fig. 11,12)
8. Insertion was done and proper post -insertion instructions were given.

III. Discussion

Prosthetic therapy for patients with acquired surgical defects of maxilla can be arbitrarily divided into 2 phases of treatment: - The initial phase called surgical obturation which entails the placement of prosthesis at surgery (temporary prostheses) or immediately thereafter (transitional). The objective of surgical obturation is to restore and maintain oral function at reasonable levels during the postoperative period until healing is completed. Three to six months after surgery, the surgical site becomes stable dimensionally thus permitting construction of the definitive prosthesis or the second phase of prosthodontic therapy.

This case report represents the fabrication of definitive obturator with cast retainers replacing temporary conventional acrylic prosthesis for class 4 maxillary defects. The interim prosthesis loses its retention, support and stability due to the tissue changes that occur after maxillectomy (especially during first 6 months). Designing a cast metal framework with linear configuration is the alternative feasible technique in such defects improving the quality and comfort of the prosthesis.

In designing of the definitive prosthesis with cast retainers, one must apply the basic principles of support, retention and stability so as to minimize the stress generated to the structures of the mouth. The location of the fulcrum line, retentive undercuts and potential for indirect retention will be important factors in determining the prognosis. In general, the prosthesis will have a fulcrum line near the defect area.

Masticatory function in patients with removable prostheses is determined by the retention, support and stability of the prostheses. It has been suggested that the quality of retention of the obturator prosthesis is dependent on the following factors: (i) Indirect and direct retention provided by any remaining teeth, (ii) Defect size, (iii) Availability of tissue undercut around the cavity and (iv) The development of muscular control. It is also suggested that obturators exhibit varying degrees of movement depending on the residual maxillary form such as amount &contour of the remaining palatal shelf, height of the residual alveolar ridge, configuration, size of the defect and the availability of undercuts.[12]

The main objective of designing a metal framework with linear configuration for class 4 maxillary defects was to select the most suitable components to resist the various forces acting on the obturator prosthesis without applying undue stress on the remaining teeth and soft tissue structures.[13]Though the pattern of forces affecting the prosthesis are complex because of their concurrent occurrence, these forces may be categorized as vertical dislodging force, occlusal vertical force, torque or rotational force, lateral force, and anterior-posterior force.

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Wide distribution of occlusal rests will help to counteract occlusal vertical force activated during mastication and swallowing. Preservation of teeth or part of the residual ridge across the midline greatly improves obturator stability. Similarly maximum support was obtained by utilization of full palatal coverage. Stress created by lateral forces was minimized by the proper selection of an occlusal scheme i.e monoplane teeh, elimination of premature occlusal contacts and wide distribution of stabilizing components. Anterior-posterior movement is counteracted by the inclusion of guiding planes on the proximal surfaces of abutment teeth. Retainers reduce the stresses transmitted to the abutment teeth while retaining the obturator in place[14, 15]. At the time of delivery of the prosthesis, patient was given proper instructions about how to place the obturator in the mouth and also about proper maintenance of the prosthesis. The patient was recalled for follow-up and satisfactory retention, support and stability levels were noticed with the use of definitive prosthesis in comparison with interim prosthesis.

IV. Conclusion

This paper comprehensively reports the fabrication of a definitive obturator with cast retainers for class 4 maxillary defects that has a metal framework which acts as the palate and supports the teeth with closed hollow bulb. This type of final prosthesis provides good retention, support, stability and comfort over conventional temporary acrylic prosthesis, thereby, improving the functions of mastication, deglutition, and speech; preventing the fluid leakage into the nasal cavity. As a result, with the ease of more comfort in the use of this type of prosthesis in regular basis, the problems encountered by maxillectomy patients diminishes slowly and even day to day mortality can be reduced with the enhancement of oro-facial cosmetic appearance and quality of socilaistic life.

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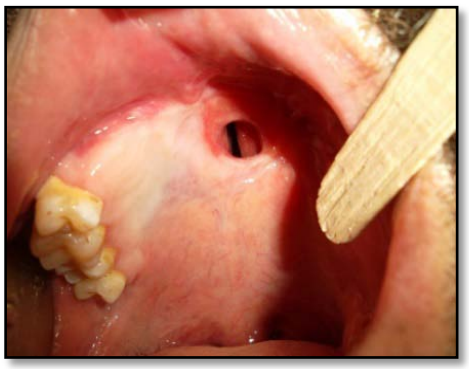


Fig. 1: Intraoral view of the defect

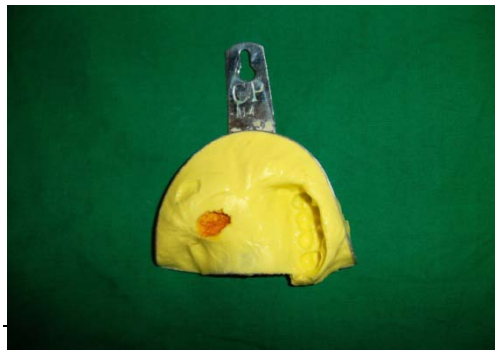


Fig. 2: Alginate Primary Impression

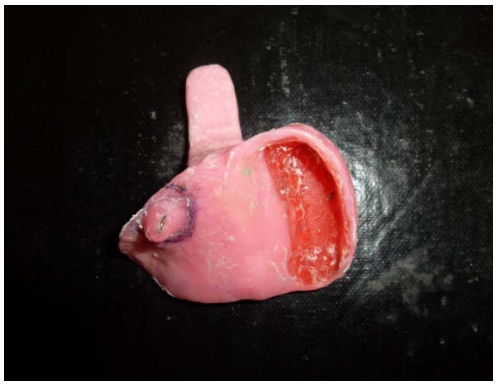


Fig. 3: Fabrication of a custom tray

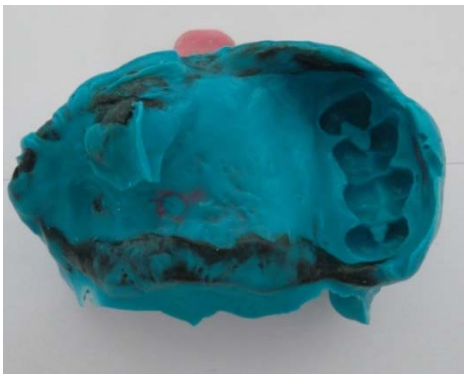


Fig. 4: Master Impression



Fig. 5: Mastercast



Fig. 6: Block out of mastercast

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Fig. 7: Wax pattern with linear configuration on refractory cast



Fig. 8: Cast partial Metal Frame work



Fig. 9 : Metal Frame work trial



Fig. 10: Jaw relations



Fig. 11: Flasking and Dewaxing



Fig. 12: Final Prosthesis

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