

Maxillary Obturator Prosthesis: Support and Retention Case Series

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ABSTRACT

An extensive intraoral maxillofacial prosthesis presents challenges to the clinician in many ways. The problems encountered include that of support and retention of the prosthesis. These problems arise due to unfavorable anatomical configuration of the defect. This unfavorable configuration may prompt the clinician to device alternate /additional means of support and retention. The aim of this case series is to review the conventional and unconventional means of support and retention for the maxillary obturator prosthesis.

Key words: Prosthesis, obturator, retention case

INTRODUCTION

The support for a maxillary obturator can be maximized by appropriate treatment planning. The liaison between the maxillofacial surgeon and the prosthodontist produces a very useful supporting area for a retentive and stable prosthesis.¹ This results in a functional obturator that will restore occlusal function, provide acceptable speech and a pleasing cosmetic appearance to the patient².

The preoperative prosthodontic treatment is required for psychological support of the patient, preoperative dental management, preoperative consultation and relevant suggestion to the surgeon^{1,3}. Review of the literature^{4-6,8-10} suggested the following strategies to be used by the surgeon to preserve the tissues for better support and retention of the prosthesis

1. Resection through the socket and not the interdental papilla.
2. More ipsilateral premaxillary area that can be preserved especially in edentulous patient.
3. Resection of inferior turbinate at the time of surgery.
4. Preservation of the remaining teeth.
5. Preservation of the maxillary turberosity especially in the edentulous patients, without compromising on the resection of tumor.
6. Preservation of contralateral anterior teeth.
7. If the palatal mucosa is not invaded by the tumor, it is preserved and reflected to cover the medial wall of the defect.
8. Avoidance of biomechanical stress raisers, and planning to reduce imparted shear forces and frictional forces.

Postoperatively the defect itself and the remaining structures after the surgery can be used to support the prosthesis.

Support from the defect: If one side of the maxillary arch is lost completely, the prosthesis will rotate into the defect unless sound support is provided within the defect itself⁶. Although this rotation is especially evident in the edentulous patients, it is also present in the partially edentulous patients and tends to place excess stress on the abutment teeth through the retentive clasps.^{12,13} Although the framework design will vary according to the size of the resection, the design objectives remain the same i.e. to distribute or control the functional forces so that each supporting or retaining element could be used to maximum effectiveness without being stressed beyond its physiological limits.^{4,10,13-17}

Structures which can be utilized for providing the support to the prosthesis from within the defect are floor of the orbit, nasal septum, pterygoid plates, infratemporal fossa and Zygomatic bone.^{1,6}

The floor of the orbit is considered in some patients if it has not been lost in the surgical or traumatic incident. Extension of the prosthesis to this level can greatly increase the weight and size of the prosthesis and can create a difficult problem of insertion and removal unless it is made in two pieces. Total obturation of the defect can also create a hyper-resonant speech quality. At the same time non-keratinized mucosa that is poor load bearer tissue may initiate irritation and pain⁶.

The nasal septum is not a major supporting tissue because of its size and respiratory epithelial lining and can be used for support of the prosthesis only after skin graft covering^{6,12}.

Pterygoid plates and infratemporal fossa are located in the posterolateral aspect of a maxillary defect, and are often the most practical and accessible areas that provide support within a maxillary defect. Contact of these structures with the prosthesis should be as extensive as possible; as this will provide a reasonable degree of support because of its location on the opposite side of the defect from the residual structures^{6,12}.

Zygomatic bone can also be utilized for the support mechanism of the obturator.¹⁹⁻²¹ If it is utilized on the opposite side of the defect, it will contribute more in the support of the prosthesis.

Support from the Remaining oral Structures: Support can best be provided by natural teeth in the form of occlusal, cingulum or incisal rests to resist tissue ward movement of the prosthesis or by partial or complete denture overlays. The load and stress distribution is along the long axis of the abutment tooth/teeth^{4,5}. Sometimes natural teeth which are unlikely to withstand occlusal stresses for extended periods, might be treated by fixed splinting to more stable teeth. Precision attachments, clasps (with or without rest)⁸ and implants^{11,21} can also provide support. The use of implants in the maxilla following cancer treatment causes problem for a number of reasons like deficient bone and radiation therapy of the area. To reduce the failure risk of implant placement in a site, evaluation of the extent and dosage of radiation must be taken into account^{7,30}.

The alveolar ridges and the palate can be used for support in edentulous patient where these are the main supporting structures.^{5,27} Occasionally soft palate can also be used for support and peripheral seal. In extensive maxillary defect the retained tuberosity can provide retention and support as the principal posterior load bearing surface.⁹ Facial and masticatory muscles tone can also be utilized in the stability of the prosthesis⁶.

For the obturator prosthesis, retention must be defined as both resistance to displacement along the path of insertion and resistance to the rotational displacement of the obturator out of the defect due to the force of gravity and function of the surrounding tissues around the obturator^{1,4}. Optimal outcome of the obturator prosthesis depends on the successful integration of the prosthesis with the patient's oral functions plus psychological acceptance of the obturator by the patient. Firmly retained prosthesis can provide the patient with psychological support during the difficult period after maxillectomy.^{2,5} In addition to the development of good muscular control quality of retention is dependent on many factors.²²⁻²⁵ (a) Size of the surgical defect/cavity (b) Availability of tissue undercut around the cavity (c) Direct and indirect retention provided by any remaining teeth (d) Material of the prosthesis (e) Condition of the underlying tissue e.g. tenderness (f) Presence of any scar due to failure of primary repair (specially on hard palate) and/or surgical repair scar (g) Trismus (h) Patient co-operation, motivation, and concern.

Retainers are probably the most important components contributing to the success of the obturator prosthesis. The design and position of the retentive clasps should be planned carefully^{12,13}. Properly designed prosthesis reduces the stresses on the abutment teeth while retaining the obturator in place^{4,5,10}. Different methods of retention have been proposed in literature^{18,19,22-26,28,29}. Physiological Methods (i) Adhesion & Cohesion (ii) Surface tension (iii) Viscosity of saliva

Mechanical methods (i) Under Cuts (Soft Tissue undercut i.e. margins of the defect. Hard tissue undercut i.e., teeth and bone) (ii) Parallelism of guide planes. (iii) Wiring with bone (peralveolar, circumzygomatic). (iv) Screws. (v) Implant housings. (vi) Magnets (Cobalt-samarium). (vii) Springs. (viii) Precision attachments. (ix) Neuromuscular control. (x) Fibrous tissue scar bands in the buccal sulcus. (xi) Biocompatible Chemical adhesives.

All the above mentioned methods can be used for the retention but some of them are quite commonly used and others are rarely used. In some maxillectomy cases commonly used (conventional) methods are not be feasible because of the defect configuration. In such cases less commonly used (unconventional) means can be employed.

CASE SERIES

Conventional means: Few maxillectomy cases are presented here in which pure conventional means of retention are used.

CASE 01

A partially dentate patient with Class III maxillectomy reported for the provision of obturator prosthesis. Healing plate/surgical obturator followed by interim obturator were made of heat cure acrylic resin. Later, a definitive obturator was fabricated with cast metal framework. The physical means of retention was employed but the main mechanism of retention was achieved by hard tissue undercuts with clasps and soft tissue undercut of the margin of the defect.

CASE 02

An edentulous patient reported with a large central defect of the palate. Mechanism of retention as utilized in complete dentures was achieved i.e. physical means of retention, undercuts and peripheral seal. Balanced occlusion and articulation was ensured.

CASE 03

This patient had Class IV surgical resection. In this case two-part obturator was fabricated. Collapsible silicon bulb was made to utilize the undercuts without compromising on the health of the delicate tissue. While the denture part was made in hard material i.e. acrylic resin and retained with wrought wire clasps.

CASE 04

In this class I maxillectomy case retention was mainly achieved by mechanical and muscular control mechanism. Adam's clasp on the tooth # 16 and a cleat on tooth #11 were given and indirect retention from tooth # 14 was obtained. The lateral margins of the defect and the polished surface of the prosthesis were also used to achieve retention by making a groove in the prosthesis which accommodated the left buccal fibrous scar tissue.

Unconventional means: In clinical conditions, where conventional means of retention for obturators are not feasible, the prosthodontist faces challenges to rehabilitate the patient. In these cases the retention is usually achieved by employing non-conventional, innovative procedures and techniques.

CASE 05

A class I maxillectomy patient (Fig 5a). After surgical and interim obturator a definitive prosthesis was provided to the patient. The surgical defect was large with no favorable undercuts, therefore splinting of all five teeth with fixed restoration was planned by incorporating the guiding planes and precision attachments (Fig 5b & c). In this case retention was achieved with the precision attachments and guiding planes in addition to the conventional system of retention (Fig 5d) .

CASE 06

In this class II resection case the periodontal condition of the remaining teeth was compromised and a large defect was present. So a two-part obturator was planned, with different paths of insertion. These two parts were joined with magnets (Cobalt-samarium) and oriented with indices on both parts. The additional retention was achieved from direct retainers on teeth # 25 and 28.

CASE 07

This edentulous patient was referred after central/ class III resection of the maxilla. The resected area was highly tender and delicate and made it impossible to utilize the undercuts present in the defect, even with soft materials. A good peripheral seal was also not achievable in the obturator segment. Therefore, it was planned to achieve retention with springs and custom made swivel locks fixed at premolar area. The spring were accommodated in the channels/recesses cut out on the buccal surfaces of the both upper and lower dentures. This avoided injuries to the buccal mucosa but did act as a reservoir for the food lodgment. Though the polished surface was designed to utilize the muscular action but the patient's muscular tone was not adequate to retain/hold the obturator by itself.

CASE 08

This class I maxillectomy patient was provided with surgical obturator /healing plate. Patient had five teeth remaining on the non-resected side but their periodontal status was unsatisfactory. Therefore additional retention was achieved by circum-zygomatic wiring with soft stainless steel wire of 0.4mm. Patient was recalled for the provision of interim obturator.

CASE 09

In this Class VI maxillectomy patient the surgical obturator was retained with Adam's clasps on teeth #46 and 56 but these clasps provided inadequate retention due to extensive defect. Therefore screw in the central palatal vault (Vomer bone) was given.

SUMMARY

The pre-surgical treatment planning is of great importance not only for the patient but also for the success of the surgical procedure and prosthesis. In different clinical scenarios whether in partially dentate and/or edentulous patients both hard and soft tissues are essentially required for the fabrication of a stable and functional prosthesis. During prosthodontic rehabilitation the support can be gained from within the defect and remaining structures. Retention can be achieved from the non-resected tissue, scars and bony undercuts by conventional and unconventional means.

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