

Prosthetic Rehabilitation of Aramany Class III Maxillary Defect with Zygomatic Implant-Supported Bar Attachment Definitive Obturator: A Case Report

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Abstract:

Maxillectomy is a surgical procedure in which a part or the entire maxilla is removed. This procedure is typically performed to treat conditions such as tumors or cancers that affect the maxilla, or severe trauma that has irreparably damaged this part of the jaw. Depending on the extent of the condition, the maxillectomy may involve removal of soft tissues, bone, or both from the maxilla. After the surgery, reconstructive procedures may be necessary to restore function and aesthetics to the affected area of the face. Maxillary defects may arise from congenital issues, developmental anomalies, or conditions acquired through cancer surgery. Surgical removal is frequently employed for patients with malignant maxillary tumors. Surgical defects vary in complexity depending on the amount of tissue loss. Basic defects can often be addressed using removable prostheses along with maxillofacial implants, attachments, adhesives, and spectacles for securing the prosthesis in place. The zygoma, which is a very dense bone, provides excellent support for dental implants. In fact, a complete arch can be replaced at once. Zygomatic implants are appropriate for dental patients who have lost bone mass due to a variety of factors, including severe acquired defects.

Keywords: Zygomatic implants, Definitive obturator, Bar attachments

Introduction:

A prosthodontist plays a very important role not only in rehabilitation of missing teeth but also in restoring extraoral and intraoral defects. Intraoral defects can occur as a result of congenital malformation, disease, pathological changes, trauma, burns, chemical radiation or surgical intervention^[1]. Oral cancer is the sixth most common malignancy in the world. The principal strategies for radical treatment for oral cancer remains to be surgery or chemoradiotherapy.^[2] However, radical resection results in severe functional impairment, including

impaired mastication and deglutition, hypernasal speech and nasal leakage, as well as psychological problems associated with disfigurement and loss of body parts leading to reduced quality of life.^[3]

An anatomically complex structure, maxilla is usually rehabilitated with the help of an obturator to eliminate oronasal and oroantral communication and to restore normal speech and dentition.^[4-6]

Case Report:

A 69 year old male patient was referred to the department of Prosthodontics, for the rehabilitation of a large maxillary defect after maxillectomy. The patient had history of Spindle cell Carcinoma, for which led to resection of the maxilla with the defect extending anteriorly involving the maxilla and the lip, posteriorly with thin band of soft palate, laterally on the right side with the presence of 16 and 17 and part of the alveolar bone surrounding that, inferiorly extending upto the roof of the nasal antrum and from TATA memorial hospital, Mumbai, 20 years back. The patient also had history of wearing an acrylic prosthesis for the defect region which became loose eventually after exfoliation of adjacent teeth due to periodontal complications.

Extra Oral examination revealed severe loss of upper lip support, poor facial esthetics, nasal twang and speech impairment (Fig 1). Intra oral examination showed Aramany Type III classification with bilateral loss of palate with the defect crossing the midline, loss of maxillary alveolus on the left region extending till the canine region on the right side, clinically teeth present in relation to 16 and 17 with oro-antral and oro-nasal communications. Patient had severe restricted mouth opening having a width of only one and half finger after irradiation for carcinoma (Fig 2).

Considering the extent of the defect with only two teeth present, retention of the prosthesis becomes questionable for which a zygomatic implant supported prosthesis with attachments were planned to achieve optimal retention and stability. After thorough clinical examination and cone-beam computed tomography (CBCT) evaluation, prosthetic rehabilitation with zygomatic implant supported prosthesis with attachments was planned for this patient (Fig 3).

A vestibular incision was given to expose the body of the zygoma followed by osteotomies of the zygoma based on the pre-prosthetic implant planning details. The osteotomy was configured for placement of two zygomatic implants in relation to 22 and 23 region of dimensions 5.0*45mm (Branemark system zygoma, Noble Biocare, United States) and 5.0*35mm (Branemark system zygoma, Noble Biocare, United States) respectively were placed in the left zygomatic bone (Fig 4) and the primary stability was achieved, followed by suturing of buccal and palatal flaps.

After 4 weeks of the healing period, the patient was recalled for the fabrication of an interim obturator. There was no evidence of infection with good healing of the soft tissues around the region the implants were placed. A removable interim obturator was fabricated conventionally using heat cure acrylic resin by making the preliminary impressions followed by Jaw relation and teeth arrangement were done by relieving the implant area and try-in was done. The interim obturator was processed using compression molding technique using customized flask using Poly Vinyl Chloride (PVC) pipe that accommodates large wax patterns and allows polymerization by using conventional technique which was explained in detail in the previous article^[7]. The retention of the interim obturator was obtained by using the favorable undercuts in the defect region and from the clasps that were placed on the first and second molar teeth present on the right side.

After 6 months following placement of interim obturator, a fixed-removable definitive prosthesis was planned by utilizing precision attachments. A ball and a socket attachment system were planned with a cast partial denture. Tooth preparation was done in relation to 16 and 17 for receiving an overlay metal which was attached to metal framework to aid in retention. Multi unit abutments having external hex of 45 degrees (Noble Zygoma, Noble Biocare, United states) were connected to the Zygomatic implants.

A special tray was fabricated for making an open tray definitive impression (Fig 5) with rubber base impression material (3M ESPE Monophase, India) and a split cast (Fig 6) was poured with type IV gypsum product (Kalrock, India) into two compartments to access the defect. An anteroposterior bar (Fig 7) was planned

with two microballs of 2.5mm diameter (Rhein 83, NY) were casted and secured using prosthetic screw on the multiunit abutment. During this procedure, wherein the prosthetic screws (Fig 8) were tiny and chance for aspiration was more a special technique was followed for the isolation of the oral cavity using regular gloves which was customized like a rubber dam and was secured in the patient's mouth using tapes (Fig 9). Later the fit of the attachments to the abutment was confirmed using an Intra Oral Periapical Radiograph (IOPA).

The master cast was scanned using an optical scanner/model scanner, that was exported to the computer aided designing software (CAD software) as STL file (Standard Tessellation Language) format for the designing of the cast partial framework (Fig 10). A selective laser melting of cobalt-chromium alloy was employed for the fabrication of the cast partial framework (Fig 11) and the trial fit was verified. During the trial fit there was a minor discrepancy with the fit for which the metal framework was sectioned into two halves and was placed inside the patient's mouth that was later secured together with the help of pattern resin. The wax occlusal rims were fabricated on the record bases for bite registration (Fig 12) and teeth arrangement, and trial (Fig 13) were done to verify function, esthetics and phonetics. The acrylization of the waxed trial denture (Fig 14) was done using PVC pipe (Fig 15) as explained earlier during the fabrication of the interim obturator. Chairside pickup of final denture was done to incorporate the metal housings (female component) (Rhein 83,NY) with nylon caps for retention.

The open bulb obturator prostheses (Fig 16) had optimal retention and stability during speech and mastication. The patient's response was satisfactory concerning speech, swallowing and mastication (Fig 17). Post insertion instructions were given, emphasizing insertion, removal and hygiene of the prosthesis (Fig 18).

Discussion:

Tumors of hard palate, maxillary sinus and sometimes the buccal mucosa or nasal cavity require surgery called a maxillectomy or maxillary resection. Depending upon the extent of the tumor the hard palate is involved which creates an anatomic defect that allows the oral cavity, maxillary sinus, nasal cavity and nasopharynx to become one confluent chamber. Lack of anatomic boundaries creates disability in speech and deglutition. Air, liquids and food bolus escape from the oral cavity to exit the nares, making adequate oral nutrition difficult. Hence prosthetic intervention should occurs at the time of surgical resection and also the remainder of the patients life^[8].

Management of patients with maxillary defects was a great challenge for the restoring prosthodontist because of compromised support and retention obtained from remaining oral structures. Microvascular flaps have been advocated to reconstruct the maxilla following the surgical resection. Microvascular reconstruction poses certain clinical risks as there could be donor site morbidity, failure of flap or fibrous union^[9].

Many factors affect the retention of the maxillary obturator namely, size of the defect, the number of remaining teeth, the amount of the remaining bony structure, and the patient ability to adopt to the prosthesis^[10].

The resection involving both anterior and posterior maxilla presents a difficult situation mechanically for obturator fabrication. The upward and outward direction of mandibular closure will tend to force the prosthesis in that direction rotating around the anterior rests. The force of gravity will tend to dislodge the obturator in a downward direction rotating around a fulcrum through the most posterior rests^[11].

In the present case, two zygomatic implants provided sufficient retention and support for the obturator. The greatest advantage of the zygomatic implant is the elimination of donor site morbidity and infection in graft material. This improved the function of the prosthesis and provided a very high quality rehabilitation for the patient.

A cone beam computed tomography is crucial for the evaluation of the zygomatic implant site, the sinus status and the implant path. The amount of bone in the zygomatic arch and in the residual alveolar crest has to be explored. The angulation, expected emergence site and the relationship of the implant body to the maxillary sinus and the lateral wall are also considered^[12].

The conventional cast partial framework design for obturator prosthesis routinely employs various clasps as retentive components, but it delivers low capacity for retention due to the plastic deformation that occurs by repeated insertion and removal of the prosthesis ^[13]. Precision attachments are considered as an excellent alternative in cases where retention is primary concern, though they are associated with additional laboratory procedure and increased cost. The incorporation of a bar design with microball attachments (Rhein 83) was planned for this case that were attached to the zygomatic implants that were placed in 22 and 23 region of the maxilla to equalize the force distribution and retention was provided by the ball attachments.

Literature shows many case reports of swallowed and aspirated dental instruments, including implant prosthetic screws and components of the attachments. Such procedural mishaps can be avoided by proper isolation of the oral cavity ^[14]. In this study we have used rubber gloves as a dental dam which was secured in the patient's mouth with the help of tapes. This helped preventing accidental aspiration of dropped instruments during the placement of the prosthetic screws. The nylon caps were placed that were easily available, cost economical and easily replaceable after wear. An open bulb definitive obturator was given for this patient that reduced the weight of the prosthesis.

The processing of the definitive obturator was done with the help of a customized flask that was made using the PVC pipe accommodates room for the fabrication of large prosthesis. The technique was followed similar to that of the fabrication of the interim obturator as discussed in the earlier article ^[7].

Conclusion:

Prosthodontic rehabilitation of the maxillectomy patient is a lengthy and involved process. However, if attention is paid to the proper sequencing and details of treatment, it can be one of the most satisfying procedures in all of prosthodontics ^[15].

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Colour Plates



Fig:1- Extra Oral View



Fig:2 Intra Oral View

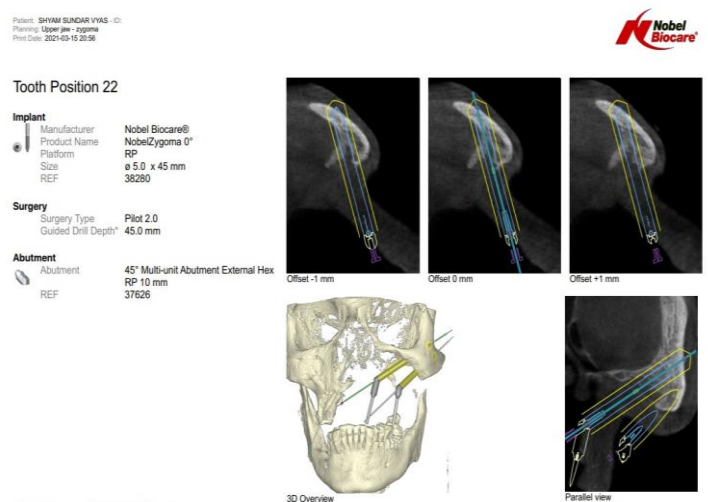


Fig :3 CBCT Planning and Evaluation

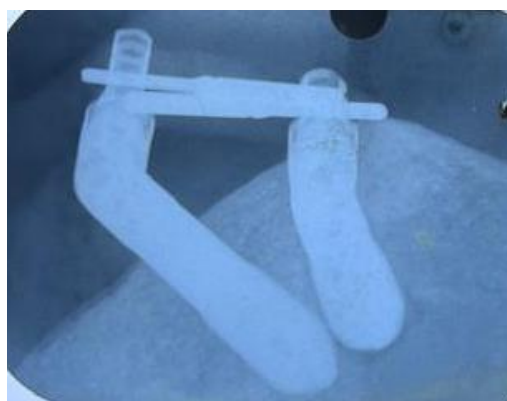


Fig :4 Intra oral periapical radiograph of Zygomatic Implants



Fig :5 Final Impression

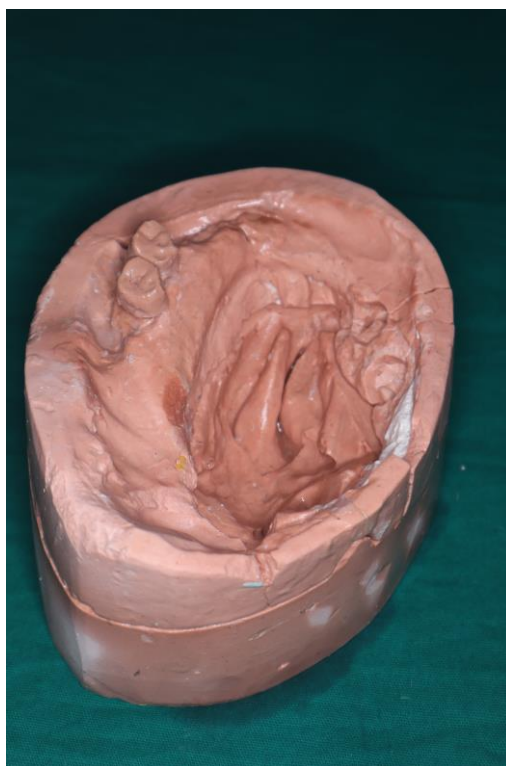


Fig :6 Split Master Cast



Fig:7 Multiunit abutments with Bar Attachment



Fig :8 Securing the screws with isolation using Latex Gloves



Fig: 9 Latex Gloves secured using Tapes

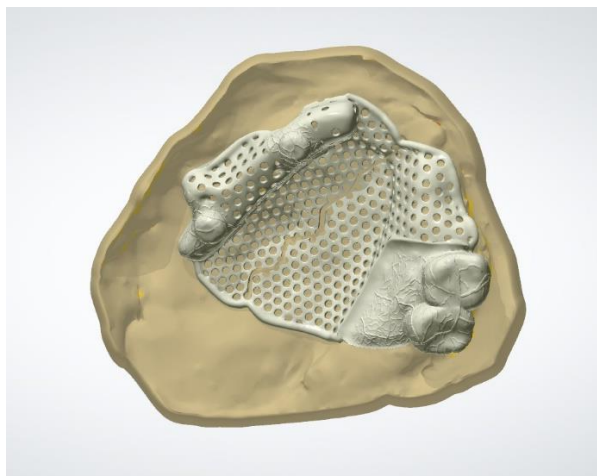


Fig: 10 Digital design of the Cast partial metal framework with Housing and Overlay



Fig: 11 Split framework approximated with pattern resin



Fig: 12 Bite registration



Fig: 13 Try- in procedure



Fig: 14 Customized Flask using PVC Pipe

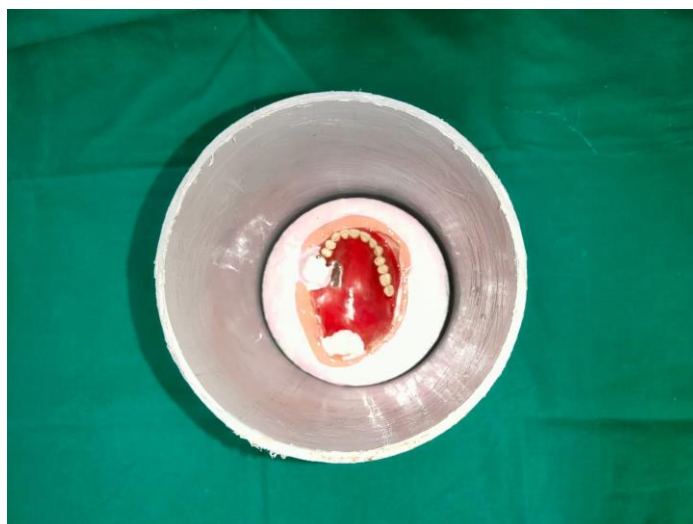


Fig: 15 Investment of the waxed up obturator inside the PVC flask



Fig: 16 Tissue surface of Defintive obturator with open bulb



Fig: 17 Defintive obturator in Patient mouth



Fig: 18 Post Operative Extra oral view