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RESEARCH ARTICLE

HOLLOW DEFINITE OBTURATOR FOR UNILATERAL SUBTOTAL MAXILLECTOMY REHABILITATION - A CLINICAL REPORT

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Abstract

Palatal defects, resulting from congenital malformations, trauma, diseases, radiation therapy, or surgical interventions like maxillectomy, pose significant functional and aesthetic challenges. These defects often lead to speech impediments, difficulties in mastication and swallowing and compromised oral hygiene. An obturator prosthesis plays a crucial role in rehabilitating these patients by restoring oronasal separation, improving speech, mastication and overall quality of life. This case report details the prosthetic rehabilitation of a 45-year-old female patient with a subtotal maxillectomy defect using a definitive hollow obturator. The transition from an interim to a definitive obturator significantly enhanced the prosthesis's retention, stability and patient comfort. The fabrication process for the hollow obturator, along with the clinical challenges and solutions, is discussed in detail. The successful outcome highlights the importance of sound prosthodontic principles and the strategic design of obturator prostheses to optimize both function and aesthetics. Future directions may include advancements in 3D printing technologies to further improve obturator fabrication and patient outcomes.

Introduction:-

Palatal defects may result from congenital malformations, trauma, diseases, pathologic conditions, radiation therapy or surgical interventions, leading to functional and aesthetic challenges. These defects compromise speech, mastication and swallowing, as well as create difficulties in maintaining proper oral hygiene due to the communication between the oral and nasal cavities. This results in hypernasal speech, nasal regurgitation of food and liquids and impaired masticatory efficiency. An obturator, a type of maxillofacial prosthesis, is commonly used to close these palatal defects and restore the functions of speech, mastication and aesthetics.

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The term "maxillectomy" is broadly used to describe various surgical procedures aimed at treating neoplastic processes that affect different anatomical sites. These surgeries often lead to significant intraoral tissue deficiencies, which can result in speech impediments, restricted mastication and impaired swallowing (deglutition). During maxillectomy, many of the retentive features used in conventional maxillary dentures are lost as a result of the surgical effort to eradicate the disease. However, even seemingly hopeless postsurgical conditions can be addressed effectively through a clinical approach that views these situations as treatable by applying sound prosthodontic principles and clinical expertise.[1]

The resultant surgical defect may involve portions of the hard and soft palates, leading to oroantral and/or oronasal communication. The reconstruction or obturation of this defect is essential to prevent the escape of air, liquid and food into the maxillary sinus and nasal cavities. By restoring normal speech and swallowing functions, this intervention significantly improves the patient's quality of life.[2]

Obturators are essential in restoring oronasal separation and improving the quality of life for patients who have undergone maxillectomy or suffer from palatal defects. The design of obturator prostheses can vary, with both solid and hollow options available. Wu and Schaaf evaluated different obturator prostheses based on Aramany's classification and found that hollow prostheses provided substantial weight reduction, ranging from 6.55% to 33.06%, depending on the defect size.[3] Numerous methods have been developed to fabricate both open and closed hollow obturator prostheses, making them lightweight and comfortable for the patient.

Obturators are categorized into three types based on the stage of treatment: surgical, interim, and definitive. The surgical obturator is placed immediately after surgery to protect the surgical site and assist in wound healing. An interim obturator is generally placed 7-10 days postoperatively, once the tissue has begun to heal and stabilize. During this phase, the prosthesis aids in speech, mastication, and psychological well-being while the surgical site continues to heal. Finally, a definitive obturator is fabricated once healing is complete and the tissues are dimensionally stable.[4]

The primary goals of the obturator prosthesis are to preserve the remaining teeth and tissue while providing comfort, function and esthetics. While the interim obturator plays a crucial role in the rehabilitation process, careful attention must be given to its design to avoid complications. The friability of tissues, particularly following radiation therapy, necessitates the use of a simple, non-traumatizing prosthesis. Adding posterior teeth to the interim obturator should be avoided as this can place undue stress on the healing tissues, potentially delaying recovery.[5] The basic design of obturator prostheses uses the available tooth and bearing tissue to achieve maximum retention and stability.[6]

Prosthetic rehabilitation with obturators can be challenging due to factors such as the size of the defect, the number of remaining teeth and the patient’s adaptability to the prosthesis. The design of the obturator, whether open or closed hollow, also significantly influences the patient's comfort and oral hygiene. The closed hollow design is often preferred as it prevents the accumulation of food and debris within the prosthesis, reducing malodor and improving hygiene.[7] Therefore, a well-fitted obturator not only enhances the functional and aesthetic outcomes but also improves the patient's overall quality of life.

Clinical Report

A 45-year-old female patient, previously diagnosed with squamous cell carcinoma of the right palate and maxillary sinus, presented to the Department of Prosthodontics, I.T.S Dental College, Ghaziabad, Muradnagar. She had undergone a subtotal maxillectomy two years prior. The patient had been using an interim obturator for the past 1.5 years but reported discomfort and loosening of the prosthesis during her recent visit.

On intraoral examination, the defect was classified as Aramany's Class II, extending from the left maxillary lateral incisor to the entire posterior region of the maxillary arch. The patient was initially rehabilitated with an interim obturator; however, due to the current issues with the prosthesis, she is now planned for a definitive hollow obturator.

Pre-Operative Intra-Oral View

The transition from an interim to a definitive obturator is essential, particularly after extended use of the interim prosthesis, as tissue changes and loosening of the prosthesis can compromise function and comfort. A hollow obturator, being lighter and more comfortable, will not only enhance retention and stability but also minimize irritation and pressure on the delicate tissues. This approach aligns with the goals of prosthodontic rehabilitation, which emphasize restoring function, esthetics, and the patient's quality of life.[6,3]

Processing Technique For Fabricating A Hollow Obturator

The fabrication of the hollow obturator begins with waxing and carving of the gingival and palatal portions of the prosthesis. A C-shaped clasp is placed over the premolar region, and ball-end clasps are adjusted by carefully removing surrounding acrylic resin from the record base. These clasps are then repositioned on the master cast in their original positions. After the wax-up of the obturator is completed and seated on the master cast, all borders are meticulously sealed using baseplate wax. The areas surrounding the re-adapted clasps are also filled with baseplate wax.[5]

Next, the waxed-up obturator is invested in a custom-made base flask. The flasked and clamped assembly is left at room temperature for 24 hours. Dewaxing is then performed, and the flask is deflasked. The denture base is removed from one half of the assembly, and any remaining wax is cleared by pouring hot water over it. After cooling the deflasked flask to room temperature, a separating medium is applied.[3]

Heat-polymerizing resin is mixed according to the manufacturer's instructions. At the dough stage, half of the resin is applied to the maxillary cast. In the defect area, a small soap ball is placed to create the hollow space, and the remaining resin is applied over the soap ball. The flask is then closed and secured to ensure complete closure, with excess resin being expelled.[7]

The flask is placed in a bench curing unit for 24 hours. The curing cycle and cooling process are followed according to the manufacturer's guidelines. Once polymerization is complete, the flask is deflasked. Two openings are created in the obturator: one on the intaglio (tissue-facing) surface and another on the cameo (outer) surface at the site of the hollowing. These openings allow for the removal of the soap used to create the hollow space.[8]

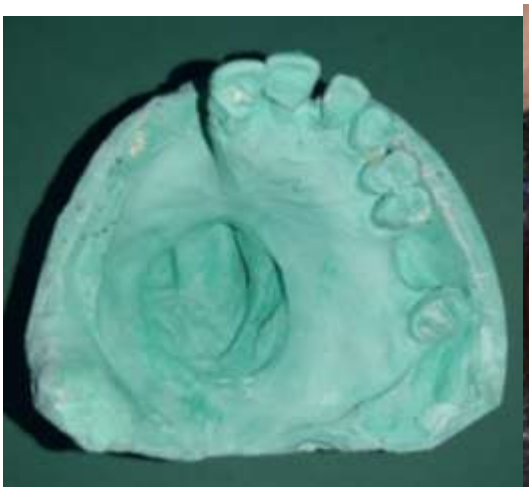
The soap is carefully removed through the openings using a carver. Hot steam is applied to ensure thorough cleaning of the hollow space, followed by normal air pressure to remove any residual soap. The prosthesis is then finished using an acrylic trimming bur and a micromotor and polishing is carried out using a complete denture polishing kit to eliminate any sharp edges. The prosthesis is then buffed to a smooth finish.[9]

To seal the openings, auto-polymerizing resin is mixed according to the manufacturer's instructions. The obturator is held in an inverted position and a small amount of the mixed resin is applied to seal the holes properly. Once the resin is cured, the sealed areas are finished and polished. The integrity of the seal is checked by immersing the obturator in a water bowl. If no air bubbles are observed,it confirms an airtight seal.[10]

This technique ensures that the hollow obturator is lightweight and comfortable, providing optimal function and patient satisfaction.

Primary Impression

Final Impression



Master Cast

Pre-Operative Frontal View

Obturator Delivery And Post-Insertion Care

After completing the prosthesis, it was remounted to equilibrate the occlusion before the final insertion. The prosthesis was carefully fitted into the patient's mouth and final occlusal adjustments were made. Once the occlusion was balanced, the prosthesis was delivered to the patient. Detailed oral hygiene instructions were provided, emphasizing the importance of maintaining cleanliness around the prosthesis and surgical site. Regular recall appointments were scheduled at intervals of 1 week, 1 month, 3 months, and beyond to monitor the condition of the tissues and to make any necessary modifications to the appliance.[2]

During the last follow-up, 3 months after the insertion of the new prosthesis, the obturator showed no signs of leakage. This success was attributed to the small area sealed with auto-polymerizing acrylic resin, which remained

intact and did not compromise the overall prosthesis. The heat-polymerized acrylic resin provided a solid, unified structure, ensuring durability and stability. The tissue in contact with the prosthesis appeared healthy and the prosthesis effectively restored the patient's speech, mastication, swallowing (deglutition), esthetics and psychological well-being.[7]

Final ProsthesisPost-Operative Frontal View

Discussion:-

The primary objective of an interim obturator is to improve speech, facilitate swallowing, and maintain oral hygiene to support tissue healing until a definitive prosthesis can be constructed.[2] Posterior teeth are typically omitted from the interim obturator to avoid excessive stress on the wound, which may delay the healing process.[2] Obturators can be fabricated as either hollow or solid, with hollow bulb obturators offering the advantage of reduced weight, thereby improving retention and comfort for the patient.[2] The interim obturator allows gradual adaptation to the new prosthesis, while the surrounding soft tissues undergo remodeling and scar band reorganization.[3] This ongoing remodeling may require frequent adjustments to the interim prosthesis. Once the soft tissues have stabilized, a definitive obturator can be fabricated.[3]

Obturator prostheses play a crucial role in restoring oral function in patients who have undergone maxillectomy.[3] The framework design for obturators may vary based on the classification of the defect, but all removable obturator prostheses should adhere to fundamental prosthodontic principles, including broad stress distribution, cross-arch stabilization using a rigid major connector, and strategically placed stabilizing and retaining components to minimize dislodging forces.[8] In the present case, a tripodal design was chosen, with support provided by the remaining teeth, palate, and rests. Rests were prepared on the right and left first premolars, as well as the first and second molars in the right quadrant of the maxilla. A complete palate design was selected to ensure maximum load distribution to the tissue.[8] Indirect retention was provided by a rest on the right first premolar, and direct retention was achieved through an I-bar clasp on the left first premolar, a circumferential clasp on the right first premolar, and an embrasure circumferential clasp between the right first and second molars.[11,12]

In dentate patients, the remaining teeth are critical for providing retention, support, and stability to the obturator. Retention can be derived from the remaining teeth, the lateral part of the defect, soft tissue undercuts, and scar bands. Stabilizing and indirect retention components must be positioned to effectively prevent the movement of the defect extension portion away from its terminal position.

Various retentive aids, including magnets, snap-on attachments, acrylic buttons, retentive clips, and implants, have been utilized in conventional obturator prostheses. Implants, a significant advancement in maxillofacial prosthodontics, enhance the retention of the prosthesis without relying on other appliances. However, factors such as cost, patient health, and bone quality may limit the use of implants.[13]

Metal framework obturator prostheses offer several advantages, such as durability, biocompatibility, and thermal conductivity, which makes the prosthesis sensitive to temperature changes.[8,2] Various methods have been developed

for fabricating hollow obturators, though many are time-consuming and complex.[7] In some cases, simple self-cured resin record bases and wax occlusion rims can be used to record accurate maxillomandibular relation records. Small defects or removable partial denture frameworks often provide the necessary stability for these records.

Exploring the use of advanced 3D printing technologies, materials, and strategies in the future could eliminate the need for vent holes and minimize the risk of water leakage and fluid accumulation in the prosthesis, thereby improving patient outcomes.[14]

Conclusion:-

Patients with maxillary defects, such as those resulting from hemimaxillectomy, often experience significant psychological distress due to impaired function and aesthetics. Prosthetic rehabilitation plays a critical role in restoring a patient's social life, aesthetics, and functions, while also boosting their morale.

This case report demonstrates the importance of preserving remaining teeth when fabricating an obturator prosthesis. The technique outlined in this article highlights a practical approach that minimizes damage to the remaining teeth while providing an effective prosthetic solution. The obturator improved the patient's masticatory efficiency, phonetics by enhancing resonance, and overall esthetics.

Rehabilitating patients with such defects presents challenges in achieving adequate retention, stability, and support. However, with thorough knowledge, skill, and a deep understanding of the patient's needs, successful rehabilitation can be achieved. The definitive obturator prosthesis, designed with maximum extension and appropriate features, significantly enhances the patient’s quality of life by improving both function and aesthetics.

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