Case Report

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Considerations for Restoring Anterior Maxillary Defects Following Malignant Tumor Resection: A Report of Two Cases

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ABSTRACT

Two female Chinese and Indian patients with squamous cell carcinoma-related postsurgical defects received restorative treatment with cobalt-chromium prosthetics. Various rehabilitation processes were assessed and debated in terms of clinical condition compatibility, integrity, and sustainability with the patient desire. The selection was removable partial denture obturator. The most important phase in planning was to specify a proper framework design that provides a safe prosthetic frame for the remaining already compromised dental, gingival, occlusion, and periodontal tissue health. In addition, the prostheses designed to be easy to clean, bioprotective, structurally well-framed to withstand occlusal loads without deformation, and cost-effective for the patients. At the same time, it addressed all of the patients' issues regarding aesthetics, liquid and food leakage, and speech hypernasality. The bioprotective concept of constructing prosthetic frameworks was shown in these instances to offer a continuous self-cleaning effect, along with additional benefits of conferring immunity to oral structures. The outcome of the treatment was very satisfying for the patient and the practitioner. It can be used as a successful model for designing a combined removable partial denture-obturator device.

Keywords: Anterior Defect; Squamous Cell Carcinoma; Intraoral Maxillary Defect; RPD-Obturator; Co-Cr Obturator

Introduction

Orofacial or maxillofacial abnormalities can occur at any time and to anyone, regardless of gender or ethnicity, even though variation is normal among populations around the world [1]. Many factors may have contributed to the occurrence. Defects can be congenital, developmental, pathological, or unintentional. In this simple context, pathological lesions may occur in any area of the oral cavity. The lesions could be benign or malignant. The National Institute of Dental and Craniofacial Research estimates that mouth cancer accounts for around 3% of all cancer cases in the United States each year. That is 60,480 new occurrences of mouth cancer per year [2]. The American Cancer Society predicts 20,420 cases of tongue cancer in 2026 [3]. The types of oral cancer are: Squamous cell carcinoma, verrucous carcinomas, minor salivary gland cancer, lymphoma, and mucosal melanoma. Jaw cancer (mandibular or palatal) can be caused by a mix of environmental and genetic causes; however, some risk factors, such as tobacco use, excessive alcohol consumption, and exposure to certain chemicals, can raise the risk of acquiring the disease. These risk factors include smoking or chewing tobacco, which is the leading cause of both hard palate and mandibular cancer. Excessive alcohol use raises the risk of oral squamous cell carcinoma (SCC); smoking combined with excessive alcohol drinking nearly doubles the risk. People who chew betel nut, a seed from the Areca tree, have an increased risk of developing jaw cancer. Another factor is that excess body weight can raise the risk of oropharyngeal and laryngeal cancer. Oral cavity and oropharyngeal malignancies are more common in people over 55 years of age [4].

Oral hygiene is being studied in relation to mouth and gum health since it may be a risk factor for oral cavity and/or oropharyngeal cancer. People under the age of 50 are more likely to develop precancerous or cancerous lesions as a result of viral infections like HPV (human papillomavirus). A diet lacking in specific nutrients may raise the risk of oral cavity and oropharyngeal cancer. People who have inherited genetic mutations, such as Fanconi anemia and dyskeratosis congen-

ita, are more likely to develop mouth and middle throat malignancies [5]. The treatment is usually excision to eradicate the tumor with a safe extension of the tissues surrounding the cancer. The next step is to prescribe a prosthetic replacement for the defected structures to restore oral function, aesthetics, and self-confidence. The eradication of SCC or any cancerous tumor is usually followed by complementary or adjuvate treatments, such as radiotherapy and chemotherapy, to eliminate any residual cancerous cells and to enhance the healing of the area after resection [6]. The focus of this report is on the prosthetic needs and management following the removal of two squamous cell carcinoma (SCC) tumors in the anterior and posterior areas of the maxillary arch.

The objectives of this report were to present examples of cases involving extended anterior defects following the resection of both soft and bony tissues in the anterior maxillary arch, which included teeth and alveolar bone. This type of defect presents several challenges, including issues related to stability, retention, support area limitations, and the aesthetic requirements of the patient, as well as the conventional concerns associated with maxillary obturation. The prosthetic treatment used for the two cases included a Co-Cr removable partial denture (RPD) an obturator. In addition, the frame design was discussed, and the best RPD frame was analyzed step by step to guide the interested practitioner in logically designing the framework. Squamous cell carcinoma or other pathological illnesses can affect the anterior portion of the maxillary arch, necessitating surgical excision of soft and hard structures. Because of its nature, ablative surgery may engage a large proportion of the tumor's surrounding structures, improving the prognosis of treatment. As a result, more healthy tissues are eliminated, causing more problems to be addressed later. However, surgical reconstruction after tumor excision is typically contraindicated due to the form, size, and aggressiveness of the disease, as well as the need for long-term surveillance of the area to rule out recurrence and ensure complete healing. Many studies have described the maxillary abnormalities caused by surgical tumour removal [7].

Due to the characteristics of pathological lesions—such as their location, extent, aggressiveness, and curability—non-standard procedures are usually excluded from the classification [8,9]. The purpose of this article was to show the prosthetic therapy of two cases with maxillary lesions involving the anterior and unilateral posterior dentate arches, which extended deeply into the antrum and the nasal cavity. The treatment plan was reviewed, with a step-by-step approach to addressing the patients' concerns in both circumstances to overcome the issues that prompted them to seek help. The repairs made use of Co-Cr RPD obturators. Depending on the amount of tissue removed during the procedure, the resected premaxillary area may connect to the nasal cavity and antrum, particularly if the excision extends deeply above the alveolar bone. However, the existence of remaining teeth in healthy periodontal condition improves the restoration's stability and retention, as well as the prognosis, longevity, and usefulness of the prosthesis. It is critical to concentrate on developing the framework to improve self-cleaning capabilities and to incorporate additional preventive technical or mechanical elements.

The occlusion contact type between upper and lower teeth during static and dynamic relationships should be thoroughly researched in order to select the optimum alternative based on the current occlusion determinants. The optimal occlusion type is required to reduce stress to the remaining natural teeth and underlying tissues in the faulty area while simultaneously offering maximum masticatory efficiency. The presence or lack of canines, together with the preceding eccentric natural occlusion type (before surgical intervention), allows practitioners to predict the possible occlusion type that may emerge during both static and dynamic relations. The chosen relationships should strive to limit prosthesis displacement, ensuring that the abutments remain in good, healthy condition throughout time; improve mastication, speech, and aesthetics; and, ultimately, provide a higher quality of life for patients. This technique is consistent with the bioprotective idea of framework design.

Case One

A Chinese lady in her fifties attended the prosthetic dentistry department asking for a treatment of her post surgery defect that involved the front and left posterior maxillary region. The examination revealed the removal of the alveolar ridge and the attached teeth from the right central incisor to the left first molar tooth. The defect extended deeply to antrum and nasal left cavity (Figure 1). Part of the premaxilla was also excised during the operation leaving the upper lip and left cheek unsupported, the naso-oral- antral communication was clear and made patient regurgitate fluids and food particles through the nose in addition to a decreased capacity to masticate food normally. The lower arch was intact, and all teeth were in normal, healthy condition except for the presence of some spacing in the anterior teeth. The patient continued to use a surgical stent to seal the defect until the area had healed completely (Figure 2). The patient's general medical records were normal. Following a discussion with the patient about the prognosis, problems of the restoration, and the need for long-term monitoring of the operated region, the agreed and approved choice was to prescribe a Co-Cr removable partial denture with an obturator (RPD-obturator) to close the defect and restore normal oral health.

Figure 1: The defect details.

Figure 2: The surgical stent.

Primary final impressions for both upper and lower arches were taken using irreversible hydrocolloid (Cavex Color Change Alginate) and a customized metal tray (Figure 3). The impressions were poured to produce working casts using hard plaster of Paris (Coecal™ Type III Dental Stone) (Figure 4). The case was analyzed for possible Co-Cr framework construction requirements, teeth surveying, contouring, occlusion correction, or other necessary modifications. The framework was designed to fulfil the most important needs of the patient retention following his experience with the temporary appliance. The right-side location of the edentulous limit adjacent to right lateral incisor demanded special attention regarding the retentive mean used on anterior teeth [7,10]. The posterior teeth were splinted using continuous palatal bar on the remaining supporting teeth (Figure 5). The framework was developed to protect the periodontal and free gingival tissues around the abutment by moving the principal connector limitations 6 to 8 mm away from the teeth (Figure 5). As a summary, the frame was designed following the bioprotective principles, whereas the metal frame margin is spaced apart from the free gingival margin to allow for self-cleansing action, restrict the vacuum impact of the frame during function, reduce microtrauma to the gingivae, and promote blood and fluid circulation by preventing tissue and vessel impingement. It also encourages the regular flow of crevicular transudate, which eliminates toxic metabolites from periodontal tissue and protects the teeth from harmful substances [10,11].

Figure 3: The final impression.

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Figure 4: The upper and lower casts.

Figure 5: The finished framework, red arrows show the location of major connector borders.

Adding to that, the abutment teeth were splinted using a face-to-face circumferential clasp and continuous palatal bar (Figure 5). The retention on the right lateral incisor was gained using a guide plate faced by suitable acrylic resin to match the gingiva color and texture (Figures 6 & 7). Another approach was discussed with the patient regarding her willingness to accept an advanced conservative treatment involving splinting the teeth with splinting bridges on the abutments with telescopic crown and special attachments. However, the patient preferred the simplest treatment without extra cost and more complicated work. The framework was fabricated following the classical procedures of Co-Cr casting. After retrieving the framework from investment, it was cleaned, finished, and polished. Then it was checked on the working model and inside the patient's mouth for any interference or mechanical insufficiency, such as retention and stability, before recording the intermaxillary relation and arranging the selected artificial teeth. The set of new occlusions was similar to the existing eccentric occlusion of the patient, which was a bilateral group function with slight anterior open bite.

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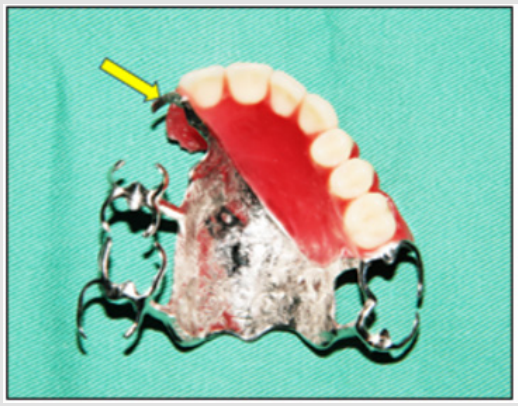

Figure 6: The trail RPD-obturator.

Figure 7: The finished RPD-obturator.

The patient desired the recreation of a slight open bite anteriorly to match her old occlusion and appearance. In similar cases, practitioners should advise the patient while also respecting their wishes, particularly when the issue pertains to aesthetics. The try-in steps were done successfully; the trial RPD-obturator was waxed, finished, and invested in the flask. The flask was opened, the wax removed, and the contents isolated and packed using hot-cured acrylic resin. The remaining procedures followed the same protocol for finishing and polishing the appliance. The patient was then scheduled to receive the completed device. The device was inspected and corrected for any complaint. The patient was given instructions for cleaning and oral hygiene and recall appointments. The patient was fully satisfied with the outcome compared to the old one (Figures 8 & 9).

Figure 8: The finished RPD-obturator.

Figure 9: The finished prosthesis with slight open bite.

Case Two

An Indian lady teacher in the late fifties was referred by the oral surgery department for treatment of her defect after a resection of squamous cell carcinoma (SCC) located in the anterior region of the upper arch. The examination revealed the defect involved the right central and left central incisors, the left lateral incisor, and the left canine. In addition, the maxillary left second premolar was also absent. The defect was communicated to the nasal cavity through an oval opening of 2-3 cm diameter (Figure 10). The maxillary arch revealed a large bi-bulbar torus measuring almost 3x3 cm in the mid-palatal region. The patient's medical conditions were under control. The lower arch was dentate, although the teeth and periodontal tissues were in excellent condition. The defect was restored with a poorly constructed acrylic resin obturator with poor retention and stability, a bad appearance, inadequate sealing of the passageway, and poor speech (Figure 11). The patient reported fluid and food regurgitation into the nose, as well as speech hypernasality, all of which are common problems with oral-nasal communication [7].

Figure 10: The defect and arch configuration.

Figure 11: The old used RPD obturator.

The assessment of the patient's demands and the maxillary defect setup highlighted the necessity for additional attention to address the identified issues. As a result, a Co-Cr RPD obturator was conceived and designed with particular emphasis on aesthetics and anterior placement of retentive components, as well as retention and stability due to the reduced support of the long-span arch defect. The design of the frame is shown in Figure 12. The framework fabrication was done following classical procedures to cast a Co-Cr alloy framework. The finished metal frame was first tried on the cast (Figure 12) and in the patient's mouth for fitness, interference, retention, and stability (Figure 13). Artificial acrylic teeth were selected and arranged after recording the intermaxillary relationship and mounted to an average articulator. The occlusion was established based on the existing contacts in static and dynamic relationships. Therefore, canine protection occlusion was generated on the intact side, while on the partially edentulous side, group function was performed.

Figure 12: The finished framework.

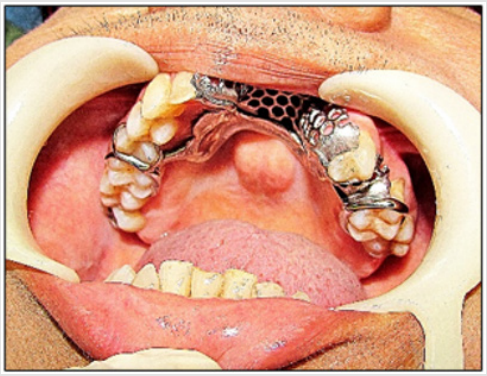

Figure 13: The framework tray-in.

Figure 14: The finished RPD-obturator delivered to the patient.

Anteriorly, the contact between upper and lower teeth should be minimal to reduce occlusal loads on the defect area. The successfully checked try-in RPD obturator was invested in a flask, and wax was eliminated and processed using heat-cured acrylic resin. The final device was finished and polished, and a delivery day was assigned. The day of insertion of the prosthesis (Figure 14), a series of tests regarding fluid and food particle nasal leaks and speech proficiency were done successfully. Retention, stability, and adaptation of the prosthesis were excellent as assessed by the patient and the practitioner. The patient was instructed to follow optimum cleaning and oral hygiene and to keep the prosthesis in a wet container while sleeping. A review appointment was scheduled for the patient to examine the case progress.

Discussion

Defects of the anterior maxillary arch vary depending on the extent of the condition, tissue involvement, and surgical technique of the malignancy. Cancerous lesions treated with surgery, radiotherapy, and chemotherapy require continual observation to detect recurrence and manage the situation appropriately. Prosthetic treatment for patients with non-standardized defects requires thorough analysis to effectively address their concerns and restore their everyday life to near-normalcy. In prosthetic dentistry, there are numerous management options available for both the profession and patients. However, the sort of intervention is determined by a variety of circumstances, including the patient's health and agreement, the dentist's experience, and the laboratory's skill and equipment. Restoring a post-surgical defect caused by SCC or a precancerous lesion necessitates a non-invasive procedure that allows for long-term monitoring of the area with the possibility of immediate intervention, when necessary, as well as complete resolution of the patient's concerns that have reduced his quality of life.

One of the most pressing difficulties in the aforementioned examples was aesthetic naturalisation. The approach of integrating previously utilised specially designed retentive components to enhance aesthetics in Co-Cr RPDs proved to be highly rewarding, cost-effective, and straightforward to implement [6,7,10,12]. The addition of the bioprotective concept to the design framework is a major preventive measure that augments the cleansing action of saliva. This concept also facilitates the continuous flushing of the gingival crevice with gingival transudate, which has antibacterial properties. It helps to distill and eliminate toxic metabolites from the crevice [9]. A search for similar research in dentistry literature indicated that implants are frequently used following reconstructive treatments for the afflicted area. However, the surgical procedures were limited to patients with significant bone resorption rather than those caused by cancer-ablative surgery. In cases of suspected tumours, practitioners should explore all simple, inexpensive, and conservative non-invasive procedures that facilitate direct monitoring of the postsurgical area, while also aiming to achieve the objectives of a functional and healthy oral cavity. An important note during the prosthetic management of cases similar to the ones mentioned above is that the redevelopment of the occlusion type should be clearly emphasized, considering the old occlusion (before surgery) and the existing occlusal determinants, which are the main factors in selecting both centric and eccentric occlusions. Minimal contact between the teeth is recommended to decrease the load on the affected area.

Conclusion

Postsurgical defects were corrected using prosthetic replacements. The management of these cases was described in detail, highlighting its convenience, affordability, patient suitability, and safety in relation to the health requirements of the condition. Therefore, a thorough investigation, prosthetic care, and continuous monitoring were crucial for postsurgical problems caused by squamous cell carcinoma. The flaws occupied the anterior part of the maxillary arch and interacted with the nasal cavity. To safeguard tissue vitality and improve patient quality of life, Co-Cr RPD-obturators should be well-designed systematically to respect the biological, physiological, and mechanical integrity of the oral cavity. The outcomes of the treatment showed very satisfied patients and excellent oral hygiene in addition to resolving all the issues related to this type of defect.

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