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QUALITY OF LIFE OF PATIENTS WEARING MAXILLARY OBTURATORS: A REVIEW ARTICLE

Marwa Mohamed Elameen Ibrahim Ali and *Weam Ibrahim

Lecturer, Faculty of Dentistry, Prosthodontic Department, Sudan University for Science and Technology.
*Assistant Professor, Faculty of Dentistry, Department of Periodontics and Community Dental Sciences, King Khalid University.

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***Corresponding Author: Prof. Weam Ibrahim**

Assistant Professor, Faculty of Dentistry, Department of Periodontics and Community Dental Sciences, King Khalid University.

ABSTRACT

Background: One of the most important structures in the midface areas is the maxilla which separates the oral, antral, and orbital cavities provide support to the globes, lower eyelids, cheeks, lips, and nose. Management of head and neck cancer may influence patients' jaws, tongue, throat, salivary glands, and/or the sensory parts of the head and neck. Subsequent to surgical resection of the cancerous tissues, patients may deal functional problems, which may influence their speech, mastication, swallowing. Additionally surgical treatment may lead to change in the patient's appearance which affect their social and professional life, this ends up by a negative impact on their psychological as well as social quality of life. Part of the functional complications may get better after maxillofacial-prosthodontics rehabilitation. this consequently will improve the quality of life for these patients. **Objectives:** Assess quality of life of patient with maxillectomy after wearing maxillary obturators. **Conclusion:** The prosthetic rehabilitation is crucial to enhancing the quality of life of patients after maxillectomy. Prosthetic rehabilitation persists an applicable treatment that improving the quality of life. Nevertheless, the choice is headed for a surgical-prosthetic symbiosis, which makes it possible to balance for the limit of each technique when used alone.

KEY WORDS: maxillary defects, obturator, quality of life.

INTRODUCTION

One of the most important structures in the midface area is the maxilla, which plays a critical role in speech, swallowing and mastication. Maxillectomy consider to be one of the most critical cases for the patient from functional, psychological, and esthetic appearance. So, reconstruction of maxillectomy defects is one of the most difficult challenges faced by the head and neck reconstructive surgeons.[1] Probably the most common of all intraoral defects are in the maxilla which could be divided into those resulting from congenital malformations and the acquired defects resulting from surgery for oral neoplasms. Post-surgical maxillary defects predispose the patient to hyper nasal speech, fluid leakage into the nasal cavity, and impaired masticatory function[2] most frequent treatment modality for patients diagnosed with a malignant tumor in the maxilla includes surgical removal of the tumor. This very often leaves an oro-nasal and or an oro-antral defect resulting in severe functional problems concerning mastication, deglutition, and speech. An appropriate substitute for the tissue lost is therefore inevitably necessary to restore function and regain quality of life (Q O L).[2]

Maxillofacial defects are usually complex, involving skin, bone, muscle, cartilage, and multi-layers of mucosa. Therefore, reconstruction of such defect is often challenging. To rehabilitate such patients a multi-disciplinary approach is needed.[3] In the total rehabilitation of the maxillectomy patient, the maxillofacial prosthodontist has two primaries objectives: to restore the functions of mastication, deglutition, speech and to achieve normal oro-facial appearance.[4] The benefit of prosthodontic rehabilitation of maxillectomies over autogenous tissue reconstruction, is that it simplifies oncological surveillance.[1] The benefit of prosthodontic rehabilitation of maxillectomies over autogenous tissue reconstruction, is that it simplifies oncological surveillance.[2] A prosthesis used to close a palatal defect in a dentate or edentulous mouth is named as an obturator.[2] Individuals who require maxillectomies often ask about the quality of life they

should expect following surgery. A well-constructed obturator can help to contribute toward a positive effect on individuals' quality of life.[5]

Aims

The aim of this article is to provide a review to the published evidence for Quality of life of patients wearing maxillary obturators to rehabilitate maxillary and midface defects. This review of literature is another effort to assess quality of life of patient with maxillectomy after wearing maxillary obturators.

MATERIAL AND METHOD

The search of the literature was performed by searching electronically (PubMed, Google scholar) identify studies published in the period 1996–2021. The key words which are used: maxillary defects, obturator, quality of life.

DISCUSSION

Maxilla

One of the most important structures in the midface areas is the maxilla which separates the oral, antral and orbital cavities, provide support to the globes, lower eyelids, cheeks, lips, and nose. Furthermore, the maxilla plays a critical role in speech, swallowing and mastication. So, reconstruction of maxillectomy defects is one of the most difficult challenges faced by the head and neck reconstructive surgeons.[1]

The maxilla comprises the paired structures of the right and left maxillae. The body of each maxilla is hollow and shaped like a pyramid, with the base situated medially and adjacent to the nasal cavity. When the anatomy relevant to palatomaxillary reconstruction is considered, the maxilla can be conveniently divided into supportive buttresses and processes. The former constitutes the foundation essential for resisting the forces of mastication, and the latter are responsible for the form of the palate and midface. Ideally, the surgical reconstruction of the palatomaxillary defect should address both anatomic units. The anatomic complexity of the maxilla is related to its 3-dimensional construct, a lattice-like structure that is supported by 3 separate buttresses. These buttresses, which form as an adaptation to the vertical forces of mastication, are the nasomaxillary, zygomaticomaxillary, and pterygomaxillary buttresses. The integrity of these structures is essential to providing a stable occlusal surface for the mandible. Furthermore, they allow for an even distribution of forces across the skull base.[4]

There are 4 processes related to the maxilla: zygomatic, alveolar, palatine, and frontal. The zygomatic and alveolar processes play a key role in the form of the midface. The zygomatic process is responsible for symmetry and projection of the malar eminence. Reconstruction of the maxilla may require reconstitution of the hard palate, lateral nasal wall, alveolus, and anterior face of the maxilla. In some situations, reconstruction of the zygoma and orbital floor is required.[4] These structures are responsible for both cosmetic and functional characteristics of the midface. Reconstitution of the buttress system and attention to the processes ensure a stable base for occlusion, which is essential to optimal functional and esthetic rehabilitation.[4]

2: Maxillary Defect and Maxillectomy

Maxillary defect can occur from congenital malformation or as a result to trauma or surgical treatment of benign or malignant tumors, which usually lead to opening between the oral cavity and the antrum and/or the nasopharynx that significantly affect speech, mastication, swallowing and impaired facial esthetics, which may result in psychological trauma.[4, 6, 7]

The defect may be in the form of a small opening resulting in a communication between the oral cavity and the maxillary sinus, or it may include portion of the hard and soft palate, alveolar ridge and the floor of the nasal cavity.[8, 9] The goal of rehabilitating these defects is to eliminate the disease and to improve the quality of life for these individuals.[10]

Treatment modalities

The defect after maxillectomy is usually a complex involving the skin, bone, muscle, cartilage, and multilayer of mucosa.[7, 11] The main treatment for these defects is prosthetic obturation or autogenous tissue reconstruction. Each technique has its advantages and disadvantages, and there is a lot of controversy which one can offer the best approach.[12] The success of surgical reconstruction of maxillary defects is determined by many factors, including size and cause of the defect, technical difficulties, requirement of multiple procedures, and medical condition of the patient.[12]

This procedure considerably increases the duration of surgical operation, has greater risk of blood loss, may lead to donor site morbidity, and possibility of bone resorption and consequent failure of the graft.[13, 14] The other option for rehabilitation of the defect is the obturator prosthesis which is used as a simple reconstruction solution for minor palatal defects, whilst larger maxillary-palatal defects represent a challenge for functional and aesthetic reconstruction in both types of treatment[15] Several advantages can be obtained from obturator prostheses, including the possibility to immediately restore the dentition without need of further surgery and enabling the residual cavity to be kept under control in case of recurrences of the disease.[15]

Although acceptable results can eventually be achieved in many cases, patients may become dissatisfied, because the removable prosthesis lacks sufficient retentiveness for adequate speech, swallowing, and acceptable esthetic appearance.[13] Poor retention because of denture bulkiness and poor residual dentition can result in

leakage and oronasal regurgitation. Patients must maintain adequate hygiene at the surgical site and around the prosthesis.[13] Possible irritation of the tissue site, the need for periodic remakes, and reliance on adhesives or some other form of retention. Sometimes, patients may even view the prosthesis as foreign that is not part of their body.[14, 16]

Multidisciplinary approach for treatment

Team members for maxillectomy reconstruction usually include maxillofacial surgeon, plastic and reconstructive surgeon, oral pathologist otorhinolaryngologist, maxillofacial radiologist medical oncologist, maxillofacial prosthodontist, speech therapist, psychologist, social workers, and nursing staff. Proper communication between the members of team is mandatory for successful management.[11, 17] Lack of communication between the surgeon and the prosthodontist can cause post-treatment complications associated with the rehabilitation of patients with head and neck disease.[18] Prosthetic intervention should occur at the time of surgical resection and will be necessary for the remainder of the patient's life.[10]

Obturator

According to the glossary of prosthodontic terms, an obturator is defined as" a prosthesis used to close a congenital or an acquired tissue opening primarily of hard palate and or contiguous alveolar structures".[19] The placement of an obturator restores oronasal separation allowing an increase in intraoral pressure and a decrease in nasal airflow rate.[20] It improves the patient ability to eat, drink, and swallow. Furthermore, it helps restore voice quality and speech articulation. Moreover, an obturator provides support to lips, cheeks, and the orbital content. It hence prevents enophthalmos and diplopia. As a result, it is easier for the patient to re-socialize.[21, 22] Post pathologic and post traumatic obturators are constructed in a sequence of three phases: the immediate temporary obturator, the interim temporary obturator, and the permanent obturator.[23, 24] Immediate obturators are inserted in the patient mouth at the time of surgery and are worn by the patients for 5 to 10 days, after which a removable interim obturator is constructed and placed for the duration of the wound healing period. Finally, the definitive obturator is constructed and placed about 3–6 months post-surgery when major changes in tissue conformation are no longer expected.[25] Problems occur when timely prosthodontic cooperation is neglected resulting in inappropriate facial contours which are almost impossible to reconstruct.[7, 26] Patients who wear obturators usually have common problems concerning lack of support, retention, and stability. Several factors to affect prognosis and successful prosthodontic treatment such as the size of defect, number of remaining teeth, amount of remaining bony structure, quality of existing mucosa, radiation therapy, and patient's own ability to adapt to the prosthesis.[21]

Surgical obturator

A surgical obturator is the first prosthetic device placed in the oral cavity post surgically. It is used to minimize postoperative complications, and to restore as well as maintain oral function to a reasonable level during the postoperative period. It is a simple, lightweight and inexpensive base plate type appliance which is constructed from the pre-operative impression cast and inserted at the time of maxillary resection in the operating room.[5, 7] Immediate prosthetic replacement is an important, successful and time-saving procedure that may afford many advantages in the surgical and postoperative management of the patient[26, 27] Pre-operative casts are used to determine the approximate boundaries of resection preoperatively by consulting the surgeon. The surgical obturator has advantages such as separating the oral and nasal cavities, providing support for surgical packing, minimizing wound contamination, reproducing anatomic integrity of the palate which enables the patient to speak and swallow immediately after surgery, improve postoperative oral hygiene, thereby reducing the incidence of local infection. All these factors result in better psychological impact of surgery.[4, 7, 18, 26]

Despite all this advantages, some disadvantages are associated with the surgical obturator as it is prepared from casts made prior to maxillectomy. They fit only loosely into defects, some leakage into the nasal cavity may occur.[4] Sometimes the surgical obturator is fabricated from a postoperative cast and placed intra orally 6 to 10 days post surgically. It is known as a delayed surgical obturator which is more accurate than an immediate one in terms of fit that can offer an alternative to immediate surgical obturators.[7] Neglecting the immediate obturator may result in serious facial appearance problems due to soft tissue contracture when wearing the permanent obturator.[26] Partial and complete denture may be adapted to be used as an immediate surgical obturators if present.[28, 29]

Interim obturator

The surgical obturator does not restore complete function during the healing of the resected area.[30] Effective obturation of maxillary defects during the healing period can be obtained using a temporary interim obturator.[10] This is constructed from the postsurgical impression cast, and allows for effective separation of the oral and nasal cavity, to improve speech quality, enhance masticatory function, deglutition and esthetics.[10] Despite all these advantages, the interim temporary obturator could be a source of pain and discomfort due to non-healed mobile, bleeding tissues, mucous secretions restricted movements of jaw and swelling during a period which is already very stressful for the patient.[25] Addition of teeth offer a great psychological benefit to the patient while light occlusal contact on the defect side may offer a great improvement of retention and stability.[28, 29]

Definitive obturator

Between six months to a year after surgery consideration may be given to construction of a more permanent prosthesis which called definitive obturator prostheses[4] Size of the defect, the progress of healing the prognosis for tumor control, the effectiveness of the present obturator, and the presence or absence of teeth, are factors which will affect the time in which definitive obturator can be constructed. Changes associated with healing and remodeling will continue to occur in the border areas of the defect for at least 1 year.[28] Fabrication of definitive obturator usually takes place when the surgical site is stable and local recurrence is ruled out.[10] The weight of the maxillary obturator plays an important role with respect to retention and comfort of the patient. It is desirable to design a lightweight prosthesis and obtain occlusal relationship to make the prosthesis esthetical as well as functional.[10, 29, 31]

Obturator retention and stability

According to Glossary of Prosthodontics Terms retention is that quality inherent in the prosthesis acting to resist the force of dislodgment along the path of placement. While stability is the quality of a prosthesis to be firm, steady, or constant, to resist displacement by functional horizontal or rotational stresses.[19] Good obturator should provide optimum separation between the oral and nasal cavity, restore facial contour, provide lip support, and improve mastication, speech intelligibility and articulation. For obturator to be good, enough retention and stability must be providing.[32] Adequate retention, support, and stability are major factors affecting prognosis prosthodontic treatment success for maxillectomies patients, because masticatory function in patients with prostheses is determined by them. These factors are affected by volume and location of postsurgical bony anatomy, availability of abutment teeth, size of the defect, quality of mucosa, availability of tissue undercut around the cavity, history of therapeutic radiation therapy, the patient's experience with dental prostheses, and neuromuscular control of the patient.[33-35]

Materials used for construction of maxillofacial prosthesis

As any prosthetic dental material, for maxillofacial prosthesis the desirable properties include durability, biocompatibility flexibility light weight, color stability, hygiene, thermal conductivity, ease of fabrication and use, texture, availability, and cost.[16] Maybe it is impossible to find all requirement in one material, but the most suitable are: methacrylate or acrylic resins, polyurethane elastomers, and silicone elastomers.[36, 37]

Quality of life

The WHO defines quality of life as 'the individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns.[38]

Quality of life (QoL) is a broader concept that is concerned either with disease or impairment that limits a person's ability to fulfill a normal role.[38] Assessment of quality of life should base on a broad range of criteria, and can be used as an outcome measure in research on the relative benefits of different treatment methods.[38] Health related QoL refers to a multidimensional concept, which encompasses perception of both negative and positive aspects of at least four dimensions of physical, emotional, social, and cognitive function.[18] It is used in many disciplines and incorporates a variety of aspects of an individual's life.[39, 40]

Many previous studies have assessed patients wearing maxillary obturators with regards to their quality of life, from different aspects including mastication difficulties, speech problems, esthetic, and psychological condition. 1990 Yoshida evaluated speech following prosthetic obturation of surgically acquired maxillary defects. Dramatic improvement in speech intelligibility was observed following placement of maxillary obturator prostheses in some patients, while other patients did not, due to insufficient velopharyngeal incompetence or unstable prosthesis. Those patients with velopharyngeal incompetence achieved adequate improvement in speech following placement of a speech appliance in combination with maxillary obturator prostheses[41] Yontchev et al. used video fluoroscopic recordings to monitor chewing, swallowing and speech in patients with congenital and acquired maxillary defects. All patients were rehabilitated with an obturator prosthesis which was stable during function. He found that patients seldom used the defective region for chewing. No leakage between the obturator and surrounding tissue was observed, either for solids or for liquids and speech production was restored almost to normal.[42] In 1996 the quality of life of maxillectomy patients with obturators was investigated by evaluating satisfaction with obturator function, as well as their psychological, vocational, family, social, and sexual adjustment. Findings suggested that a well-functioning obturator significantly contributes to improving the quality of life of maxillectomy patients.[12]

Sullivan studied the impact of palatal prosthodontic intervention on communication performance of patient's maxillectomy defects and discovered that obturation is an effective intervention for defect of maxillary sinus and alveolar ridge on speech performance. Variation on effectiveness were noted based on site and patient satisfaction with the intervention.[43] Rogers[44], in a cross-sectional study, evaluated the health-related quality of life of patients following maxillectomy and to compare obturation and free flap reconstruction. No statistically significant differences were seen between the obturator and free flap groups. Obturator patients were more concerned about their appearance, had more pain and soreness in their mouths, were more aware of their upper teeth, more self-conscious, less satisfied with their upper dentures, and less satisfied with function. Similar

subjective outcomes were found for both groups, and recommended larger longitudinal studies to test these relationships more accurately.[44] Rieger et al. related the patient satisfaction scores obtained by questionnaire with those obtained by means of clinical speech measurements. Results revealed that poorer aeromechanical speech results were associated with patient-reported avoidance of social events, whereas lower speech intelligibility outcomes were related to overall poorer perception of speech function on the OFS.[45] Genden at al.in 2003 compared the functional and QoL outcomes in patients rehabilitated with a prosthetic obturator with defect-matched patients who underwent reconstruction with a vascularized bone-containing free flap. Results revealed that the reconstruction patients enjoyed a better QoL without incurring significant donor site morbidity. Although palatomaxillary reconstruction with vascularized bone-containing free flaps requires a second operative site, this method of oro-dental rehabilitation of the hemi-palatomaxillectomy defects can achieve superior functional and QoL outcomes relative to defect-matched patients rehabilitated with a prosthetic obturator.[46]

Hertrampf et al. demonstrated that patients with maxillofacial defects face numerous QoL related problems, even after prosthodontics treatment has been completed.[47] Arigbede et al.[48] assessed the effectiveness of the maxillary obturator as a speech rehabilitation aid and examined the influence of the classes of surgical defects on speech intelligibility. Results supported the widely held view that the maxillary obturator is a useful speech rehabilitation aid. It also showed that immediate, interim, and definitive obturators were all important in the speech rehabilitation of patients with surgically acquired maxillary defects. Their finding also revealed that speech intelligibility was affected by the class of defect.[48] Matsuyama et al. objectively assessed chewing function of obturators measuring the masticatory performance and maximum occlusal force. No difference in masticatory performance existed between obturator wearers and the control group.[49] Speech intelligibility in patients with clefts before and after placement of a speech prosthesis were evaluated by Pianto, who found that the speech of patients with cleft palate who were rehabilitated with a speech prosthesis significantly improved.[50]

A study conducted in Ireland, sought to determine patient quality of life and function after prosthetic rehabilitation for maxillary and palate defects following cancer resection. The result supports findings that good obturator function is associated with a better quality of life, and found that leakage when swallowing foods were the most frequently reported problem with the obturator.[51] A study by Turkaslan revealed that neglecting immediate obturator construction may cause serious facial appearance problems due to soft tissue contracture. They commented that when permanent obturators are neglected, serious contracture of soft tissues and facial disharmony is inevitable.[26] Riaz investigated how patients with maxillofacial defects evaluated their quality of life after maxillectomy and prosthodontic therapy with obturator prostheses in using a standardized questionnaire. He found that orofacial rehabilitation of patients with maxillofacial defects using obturator prostheses is an appropriate treatment modality.[52] He recommended that to improve the situation of patients prior to and after maxillectomy sufficient information about the treatment, adequate psychological care and speech therapy should be provided.[52] A cross-sectional study by Depprich et al, investigated how patients evaluated their quality of life after maxillectomy and prosthodontic therapy. According to the results, QoL of obturator patients was not significantly related to age and gender, nor size of tumor. Patients with the highest level of education rated their quality of life significantly higher compared to those with little education. The extent of therapy also correlated positively with the quality of life. A significantly better average rating was found when patients had received surgery only compared with patients whose treatment had consisted of surgery plus radiation and chemotherapy. Neither the classification of maxillary defects nor the type of surgery had a significant influence on the patients' evaluation of their quality of life. Functional impairment as a result of maxillary resection generally impinged on the patient's life and the grade of impairment correlated negatively with the quality of life.[53] Moreno et al. compared microvascular free flap reconstruction versus palatal obturation for maxillectomy defects. He observed that the palate can be successfully treated with either an obturator or free flap reconstruction. Extensive defects had a better functional outcome with free flaps. Evidence did not suggest that free flap reconstructions delayed diagnosis of local recurrences.[1] Cordeiro studied the best approach for reconstruction of complex midfacial defects and found free-tissue transfer, offers the most effective and reliable form of reconstruction for complex maxillectomy defects' flaps consistently provides the best function and aesthetic results.[54] Kumar et al in 2013, assessed the Q of L in maxillectomy patients in a longitudinal study, and commented that obturator prosthesis is a highly positive and non-invasive approach to improve the quality of life of patients with maxillectomy defects.[55] Gerdzhikov in 2015 followed up the main problems of patients with maxillary resection and their influence of life quality before and after prosthetic treatment and found that the numerous problems which occurred after maxillary resection, complicate prosthetic treatment and make quality of life worse.[56] Chen et al. studied to evaluate the functioning of obturators prosthesis in patients with unilateral defects after maxillectomy. The result support that obturator prosthesis improves oral function of patients after maxillary defects: the retention of the obturator prosthesis enhanced by the addition of attachments showed more benefits in oral function[57] Ggastaldi et al. 2017 concluded that after use of maxillofacial prosthesis

patients feel more confident and self-assured. maxillofacial prosthesis is good solution in order to improve the life's quality in patients with tumors re-sections.[58] Rangel Goulart et al. studied quality of life of patients with facial prosthesis, demonstrated the importance of conducting systematic follow-ups to these patients.[59]

Recently several studies confirm the importance of maxillofacial prothesis in improving the patients quality of life and enhancing their chances to get back to normal social life.[60, 61]

CONCLUSION

Rehabilitation of patients with maxillary defects using obturator prosthesis is an appropriate and not invasive mean of treatment modality. Results support that good obturators contribute to a better life quality.

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