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Review Article

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PROSTHETIC CONSIDERATION OF MAXILLOFACIAL RECONSTRUCTION USING OSSEO-INTEGRATED IMPLANTS

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Abstract

Maxillofacial prosthodontics plays a major role in the overall rehabilitation of patients who have undergone tumor resections and trauma or have congenitally missing body parts. The purpose of this review was to give an insight about improving retention and functional rehabilitation of silicone prostheses with the help of Osseo integrated implants, which is one of the most recent and successful advances in the field of maxillofacial prosthetics. Placement of implants for retaining prosthesis depends on a number of factors such as presence of bone, the dexterity of the patient, soft tissue conditions, prognosis of health for the patient, radiation therapy and economic conditions. Implants offer a high degree of stability, retention and comfort. Dental implants support arise confidence of the patient in public.

Key Words: Retention, Maxillofacial prosthesis, extra oral implants

INTRODUCTION

Head and neck reconstruction is one area of clinical endeavor in which investigators have long expressed a desire for permanent percutaneous connection. Autogenous head and neck reconstruction is not always possible, may not be desirable, or may be delayed. Prosthetic reconstruction becomes the treatment modality of choice in such circumstances. In these situations, a permanent percutaneous connection anchored in underlying bone supports facial prostheses.[1]

The loss of facial structures through ablative or traumatic activities may produce significant psychological trauma in the patient that exceeds the actual physical loss. Although surgical procedures may be able to fill in or close off large defects, their results may be less than optimal in providing acceptable level of function and aesthetics. An alternative is the prosthetic restoration of their facial defects.[2]

Need for Osseointegrated Implants

The standard technique for retention of facial prostheses has been through the use of adhesives. The success of a prosthesis is often affected by its ability to withstand daily wear and tear associated with use. Mechanical manipulation required to remove adhesives, entrapped skin oils, and debris from the prosthesis has a tendency to produce tears on the margins and separation of the polyurethane backing from the silicone. These defects decrease the aesthetic quality and life span of the prosthesis.[2]

The use of endosseous implants, have improved retention, stability, and aesthetics, resulting in more natural appearing and functioning prostheses. [2]

Richard R. Seals etal; the application of osseointegrated fixtures to the cranial skeleton for facial prosthesis, retention minimized problems with marginal integrity, placement misalignment, and prosthesis camouflage. There was a diminished dependence on adhesives and therefore eliminated adhesive induced material degeneration/ discoloration and skin reactions. There was also dramatic increase in the level of functional rehabilitation of the patients with congenital or acquired facial defects.[3]

Criteria for success of craniofacial osseointegration implants

Since the introduction of craniofacial osseointegration in 1977, there have been essentially two variables used to evaluate treatment outcome in the literature : individual implant success and skin response. More recently, other variables have been reported and,

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importantly, among these are patient response to treatment,

The Swedish Council on Technology Assessment in Health Care[4]

- The implants are immobile, as verified by clinical examination.
- No prolonged symptoms, such as pain, infection, tactile disorders, or nerve damage, should be present in connection with the implants.
- Penetrated soft tissue should be free from irritation in at least 85% of the regular outpatient postoperative checkups.
- At least 95% of the temporal bone implants and at least 75% of other extraoral implants should be functional after 5 years.

Jacobsson et al[5]

- Individual unattached implants should be immobile when tested clinically.
- Soft tissue reactions around skin penetrating abutments should be of types 0 (reaction free) or 1 (slight redness, not demanding treatment) in more than 95% of all observations.
- Individual implant performance should be characterized by the absence of persistent or irreversible signs and symptoms such as pain, infections, neuropathies, or paresthesia.
- In the context of the above, a success rate of 95% in the mastoid process and 90% in the orbital region, in nonirradiated bone tissue, at the end of a 5 year observation period should be a minimum criterion for success.

Classification of Soft Tissue Response to Percutaneous Titanium Abutments: [6]

Class	Description
0	No irritation: epithelial debris removed if present
1	Slight redness: temporary local treatment
2	Red and slightly moist tissue; no granuloma formation; local treatment; extra controls
3	Reddish and moist; sometimes granulation tissue; revision surgery is indicated
4	Removal of skin penetrating implant necessary as a result of infection
R	Removal of implant for reasons not related to skin problems

PROSTHETIC CONSIDERATIONS

According Sweenay *et al* (1972) when considering prosthesis for patients with missing facial structures one must evaluate subjective as well as objective factors.

Previous Prosthesis Experience

Patient experience with previous prosthetic interventions must be elicited. A history of successful prosthesis use may be a good indicator of future success if the patient has not recently experienced significant changes in the supporting structures. Conversely, patients who have never experienced satisfaction with facial prostheses are unlikely to find significant improvement with a new prosthesis unless their chief complaint has been one of poor prosthesis retention. If retention is identified as the cause of prosthesis failure, the benefits obtained through the use of endosseous implants for prosthesis support and retention may be profound. Complaints regarding color, contour, texture, or the removable nature of the prosthesis will not, however, be altered by techniques that are designed to improve prosthesis retention.

Objective considerations are related to the size, shape, and location of the defect. Residual structures must be assessed for their capacity to support and retain a prosthesis. Osseous structures are evaluated to determine the potential of endosseous implant placement if this method of retention is considered. If adhesive retention is anticipated, the soft tissue surrounding a defect is studied to ensure that the potential for prosthesis extension is sufficient to provide a zone for adhesive application. Likewise, undercuts within a defect may provide mechanical retention when other forms of retention are insufficient.[7]

Numerous factors must be assessed when facial prostheses are planned. It is important to realize that each patient is an individual with specific concerns and needs.

Diagnostic Media

Diagnosis and treatment planning depend on the accumulation of sufficient data to allow the restorative team to develop a comprehensive analysis of the need sand findings. Extensive problem – oriented examinations are performed. Examination must include a thorough review of the bone and associated soft tissues in the area of concern as well as an analysis of all pertinent radiographs. Facial moulage impressions are made for diagnostic purposes. After the fabrication of diagnostic casts, wax trial prostheses are made, with particular attention to the orientation of these prostheses to the

frontal, sagital, and coronal planes.

Diagnostic casts and oriented wax trial prostheses are reviewed to assess potential areas for prosthesis retention. These aids provide visual information regarding alternative means of mechanical retention for the facial prosthesis. The wax trial prosthesis is made after evaluation of presurgical photographs, presurgical casts, contralateral anatomy, and estimation of normal anatomic forms. When no other data are available, blood relatives may be assessed for facial similarities. Once all material is gathered and the potential for adhesive and mechanical retention is determined, a decision is made regarding the need for auxiliary retention in the form of endosseous implants.

Defect Etiology

The etiology of a defect may provide the clinician with information regarding the prognosis and the potential for further surgical procedures in the near future. When the defect has stabilized post-operatively, reconstructive efforts, including placement of endosseous implants, may be considered to provide definitive solutions to anticipated prosthesis retention concerns. Conversely, if further surgical intervention is anticipated, endosseous implant placement may not be practical at that time.

Congenital Defects

Congenital abnormalities are unlikely to result in complete absence of the eyes or nose. In contrast, microtia or agenesis of the ear is associated with several congenital syndromes. Treacher Collins, Crouzon's, and Pierre robin syndromes are examples of the syndromes that are associated with facial deformities, palatal clefts, hearing loss, and significant malformation of the external ear. These conditions often require multiple surgical procedures throughout the early years of life to provide the patient with near normal physiologic functions of mastication deglutition, and respiration.

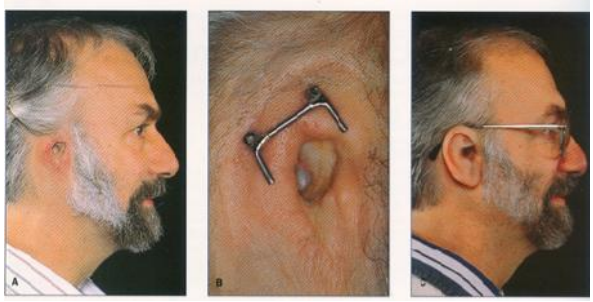

Figure 1 Auricular Prosthesis

These patients may experience numerous surgical attempts to reconstruct the external ear but often find cosmetic results lacking.

Once adolescence is reached, continued surgical revisions are unlikely because a point of diminishing returns often is met. Because a stable defect is anticipated, definitive reconstruction using a synthetic prosthesis is common. One may anticipate a tissue bed that has been significantly altered by prior reconstructive efforts. Cicatricle changes, loss of anatomic landmarks, and alteration of normal architecture are common. Adhesive retention for auricular prostheses is usually successful if tissue irregularities such as tissue tags or residual anatomic structures are present. In the absence of anatomic landmarks that can be used for prosthesis orientation, adhesive retention may be a compromise because it is difficult for the patient to repeatedly position the prosthesis for maximum adhesive contact with the underlying skin. In this event, endosseous implants may provide retention and support that would not otherwise be available for facial prostheses.

Acquired Defects

Acquired defects may cause the loss of any facial part. The traumatic or neoplastic etiology is important for determining the type of treatment.

Neoplasm

Benign and malignant neoplasms may cause the loss of facial structures. Basal cell carcinoma is the most common form of skin cancer in the head and neck region. Basal cell tumors normally are excised with narrow tumor-free margins. This surgical approach is recommended because basal cell tumors are unlikely to exhibit local or regional metastasis. Unfortunately sun-induced skin changes may cause multiple primary tumors, resulting in a need for multiple surgical procedures in a small areas. Significant facial defects from benign lesions are usually the result of multiple contiguous operations.

Malignant lesions more frequently result in loss of facial structures. Skin cancers such a squamous cell carcinoma and melanoma are more aggressive, both locally and distantly, than basal cell carcinoma. Tumors located deep to the skin may require more extensive surgical resection that can result in the loss of facial structures. The potential for recurrence of any of these tumors may influence consideration of implant placement.

Trauma

Traumatic events such as motor vehicle accidents, explosive injuries, and gunshot wounds can result in the loss of facial structures. Tissue damage due to trauma lacks the level of predictability seen with surgical excisions of tumors are in the surgical reconstruction of congenital defects. These defects can be associated with large areas of tissue damage, resulting in a lack of tissue foundation for restorative endeavors. Traumatically induced tissue loss, however, is unlikely to recur.[8]

Anatomic Areas

Auricular

Prosthetic replacement of the external ear normally has a favorable cosmetic result. Adhesive retention of these prostheses is often less than satisfactory as a result of 1) the lack of facial contours that may assist in the accurate positioning of the prosthesis and 2) movement of associated facial structures with mandibular movement.[9]

Endosseous implant support and retention for prosthetic replacement of the ear has been well documented in the literature.[10] Implant survival has proved to be so predictable that the historic recommendation of three implants now may be decreased to two implants. From a prosthetic standpoint, fewer implants make implant and bar splint interference in prosthetic design less likely.[11]

The restorative team must provide the surgical team with information regarding the ideal placement of the endosseous implants. Anatomic landmarks assist in the location of implants, but diagnostic wax patterns of the ear may prove more valuable in determining implant location.[12]

Nasal

Nasal prosthesis must gain adhesive retention from a wide extension of the prosthesis beyond the defect, which may negatively influence the cosmetic result. Mechanical retention by extension into the defect or through contact with eyeglasses may augment adhesive retention.[13]

Movement of the muscles of facial expression may either dislodge a nasal prosthesis or encourage space to become evident between the prosthesis and the skin. This movement, when encountered in the inferior half of the nasal area, may be counteracted through the use of endosseous, implant retained bar clip assemblies.

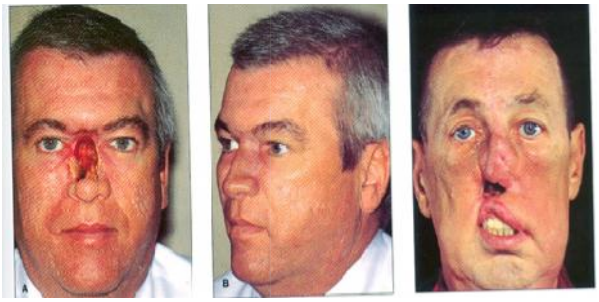

Figure 2 Nasal Prosthesis

Implants for nasal prostheses are placed vertically into the floor of the nose. The implants should be placed such that the implant body is within the confines of the nasal prosthesis. Normally, this arrangement requires two implants, with one implant placed to the left and one to the right of the maxillary mid-line. Presurgical planning requires communication with the surgical team.

Orbital

Replacement of the orbit and its contents through the use of an adhesive retained prosthesis is a predictable procedure. Defects should be lined by a skin graft to ensure adequate tissue for prosthetic support. It is only when the orbital contents as well as contiguous facial structures are lost that implant retention becomes more critical.[14] Implants may be placed in the lateral and superior aspects of the orbital rim with a reasonable expectation of success.

Figure 3 Orbital Prosthesis

Implant placement should be well planned to ensure that implant angulation or implant body or subsequent bar splint placement does not interfere with normal contours of the facial prosthesis. Implant prominence could result in excessive bulk in the prosthesis-an unfavorable cosmetic result. Diagnostic impressions and prosthesis wax patterns assist the restorative team in determination of ideal implant location.

Oral-Facial

Many facial defects are associated directly or

indirectly with maxillary defects of various configurations. Nasal and orbital defects often communicate directly with maxillary defects. Although most facial defects are rehabilitated for cosmetic and psychosocial reasons, oral defects require rehabilitation for physiologic reasons as well. A patient's inability to speak, swallow, and chew dictates the need to restore a separation between the mouth and the nasal and paranasal structures. The separation of the mouth from the structures above is most commonly provided with an obturator prosthesis.[15]

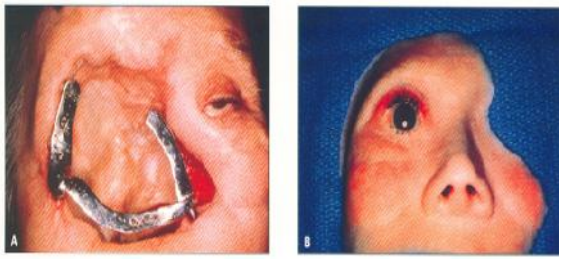

Figure 4 Oro-Facial Prosthesis

In many patients the absence of some or all of the teeth in the remaining maxillary segment seriously limits the prosthodontist's ability to fabricate an acceptable prosthesis. The configuration of the remaining had and soft palate and the curvature of the maxillary arch in the remaining segment also influence retention and stability.[16] The potential for placement of osseointegrated implants into edentulous areas in the remaining segment or in bony remnants within the defect, such as the zygomatic arch, must be considered as a means to provide the optimal degree of retention and stability for an obturator prosthesis.

Consideration of placement of osseointegrated implants into the remaining maxillary segment must follow the same principles as placement of implants in conventional maxillary implant situations. Sufficient bone of good quality must be present in sites that allow placement of implants that can be acceptably used from the prosthodontic standpoint. These implants are likely to receive more stress from a large removable prosthesis than implants used to replace missing maxillary teeth only. The limited amount of available bone and the type 3 to 4 quality of bone suggest the need to maximize implant placement if possible. Placement of onlay or inlay bone grafts in conjunction with the implants often may be needed.[17]

CONCLUSION

During the last decade the advent of tissue-integrated prostheses has significantly improved treatment results achieved in the management of congenital, surgical, and traumatic defects of the craniofacial region.

Bone anchored implant retention offers patients who wear facial prostheses increased security, especially with large defects or where the prosthesis rests on highly mobile tissues.

The implant team must develop a coordinated treatment plan that is delivered in an efficient manner. The highest standards of aesthetics and retention should be met. The Prosthetic consideration as well as attention should be paid to the fitting and care of soft tissues as to the issues of hardware articulation and registration. A commitment to follow up for the clinical evaluation of implant tissues and the maintenance and periodic replacement of the facial prosthesis are a team responsibility and in the best interests of the patient.

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