Rama Univ. J. Dent. Sci. 2019 June 6(2):5- 8 ISSN No. 2394-417X (print), 2394-4188 (online)

Review Article

Treatment Planning for Implant Reinforced Facial Prostheses

R Raheja[1], T Mahajan[2], A.V. Rajanikanth[3], A. Sharma[4], C. K. Roy[5]

Abstract

Surgery on malignant tumors in the head-neck region generally causes large tissue defects. Maxillofacial prostheses appear as an alternative for cases where surgical reconstruction cannot be applied. In previous periods, retention of the maxillofacial prosthesis has been generally made by using liquid- or spray-formed adhesives, adhesive bands, eyeglass connection, and hard or soft tissue retardations. Osseo-integrated implants used in treatment of edentulous cases are used for reinforcing facial prostheses and providing retention and stability.

Keywords: Implant prosthesis, Osseointegration, Prosthetic design, Retention and Stability of prosthesis.

Introduction

The success of rehabilitation of patients with maxillofacial defects depends on patient's motivation, inter-disciplinary co-operation, and application of adequate surgical and prosthodontic techniques. Ideally, all the treatment options, such as surgical reconstruction and implant reinforced reconstruction, must be discussed before the surgical operation. If the organ to be removed by surgical operation is thought to be rehabilitated by implant reinforced prosthesis, soft and hard tissues around the surgical area should be prepared for placing implants by performing some arrangement during surgery. Bone regions which are important for the placement of osseointegrated implants must be protected as much as possible or they must be resized to appropriate sizes to place implants by reconstructive processes. Thickness and mobility of the tissues near the defect edges are especially important for achieving aesthetic results. Because of muscle movements on the face, appearances of facial prostheses around areas where tissues move create aesthetic problems. Therefore, ideal indications of implant reinforced prostheses are the prosthetic treatment of resection in auricular, nasal, and orbital cases. In order to prevent inflammatory reactions, thin and hairless tissue must be created around the implant. Because of defect size and position, existing bone volume and quality, soft tissue thickness and mobility differ individually in maxillofacial prosthesis.

Implementation, making the general rules of maxillofacial prosthesis production for intra-oral rehabilitation is very hard. Depending on this, the number and location of implants to be placed will vary. While, generally, two implants are sufficient for the retention of auricular prostheses, as many implants as possible should be preferred in order to provide force distribution for medium-large maxillofacial defects. Generally, the temporal bone, supra-orbital edge, lateral orbital edge, zygoma, piriform bump, and pterygoid process are accepted as anatomical regions having enough bone volume to reinforce implants.

Details of Regions in Implantation and Success

Although inflammatory reactions may occur around maxillofacial implants, they are successful in auricular, orbital, and nasal prosthesis reinforcement and they can have a success rate even in the treatment of toothless mouths by using standard implants. Due to certain anatomical structures, we can find that implant success rates in implant reinforced maxillofacial prostheses could reach 95% and more in the mastoid region, 35-91% in the orbital region and 71-81% in the nasal region.

We can express the causes of lower success rates of implants in orbital region as follows:

- Patient cannot see the prosthesis region and so he cannot provide adequate hygiene,

[1]Dr. Rosy Raheja, MDS, Prosthodontics, Rama Dental College, Hospital & Research Centre, Kanpur. Uttar-Pradesh, India.
Email:rosy.raheja@yahoo.Com
[2]Dr. Tanu Mahajan, (HOD), Prosthodontics, Rama Dental College, Hospital & Research Centre, Kanpur
Email:drtanumahajan_27@yahoo.co.in.
[3]Dr. A. V. Rajanikanth, Professor, Prosthodontics, Rama Dental College,Hospital & Research Centre, Kanpur.
Email: rajanikanthayinampudi@yahoo.co.in
[4]Dr.Ankur sharma, MDS, Orthodontics, Himachal dental College, Sundernagar.
Email: drankur3107@gmail.com
[5]Dr Chandan Kumar Roy, MDS, Prosthodontics, Rama Dental College, Hospital & Research Centre, Kanpur.
Email: chandanroy0071@gmail.com

- Older patients are not be able to use their hands effectively in such a way as to provide hygiene,
- Because the periosteal bone near the orbital is thin and atrophic, its remodelization specification is not adequate,
- Chronic inflammation around implant environment,
- Bone correction operations during surgery for making maxillofacial implants cover the bone.

The positioning and angling of an implant is a hardness belonging to a region and it is most frequently seen in orbital and mid-face prostheses. Thinning the implant's environment decreases these complications. In case of trauma or tumor resection defects, skin and tissues under the skin are generally thin, and tissues are attached to the periosteum under them. This creates the ideal environment for protrusive implants. In the contrary scenario, there are thick and mobile tissues in cases of patients with congenital malfunctions. The soft tissue complications of those patients can be minimized by carefully thinning the flap in a second phase surgery or by placing skin grafts on implant regions as split thickness. In most of the data, success rates for the auricular region in craniofacial implant placement exceed 95% and very few complications have been observed. Auricular implants can be placed on the mastoid region where it is determined to be the best location for implants in terms of bone volume and blood build-up. An angled incision is made 30mm behind the external auditory canal in the mastoid region. Typically, two implants are placed 15mm and 18mm behind the external auditory canal. The aim of this is to place a holder tissue bar beneath the anti-helix part of the prosthesis. Generally, two implants are enough for retention of an auricular prosthesis. If any hearing device will be used, or if there is any doubt about the success of existing implants, an additional implant can be placed. A non-tensioned periosteum with thinned environment is left and sewed around the implants. All of the subcutaneous fat, muscle, and collagen tissues are removed. The success rate in nasal regions is between 85 and 90%. Very few soft tissue complications are observed for implants placed on the bottom of the nose. If the patient has no teeth in his maxilla, bone volume may be sufficient to vertically place implants on the nasal base. Two pieces of 4mm implants or longer dental implants can be placed in that region. If the teeth have roots, the lateral wall of the piriform aperture may be selected in order to place an implant horizontally. If nasal bones are resected, implants may be placed also on the glabella region. The second phase procedure for the nasal region is similar. In order to make immobile tissue layers with the use of upper structures as short as possible, tissue volume should be decreased as much as possible. Implants should be placed 8mm or 10mm away from the nasal base, and they should be placed in the anterior region so that the implants can be outside the attached and immobile tissues. If the implants are out of mobile tissues of lips, the incidence of soft tissue reaction around the implants increases. If implants are placed too far back, providing hygiene becomes harder. The success rate of implants in the frontal bone and around the orbital is very low if those regions have been treated with radiation. Their failure rate is higher when compared with auricular and nasal base regions. Superior and lateral orbital edges are suitable for orbital defects. The usage of free skin grafts is not necessary for the orbital edge region. If the bone volume is sufficient, 4mm length implants are used. The usage of three implants to hold orbital prostheses is the best, but the risk of implant loss and high possibility of having radiotherapy in that region require the usage of more implants. For most cases, four or five implants are preferred. By placing those implants, the optimal positioning and angling must be considered. This is important, especially in order to avoid problems during insertion and extraction of the prosthesis. Also, for hygiene, there must be at least a 10-12mm distance between implants. The upper structure and the implants which do not affect contours of the orbital prosthesis must be considered and implants should not be placed too far in front. Maxillofacial implants have a higher failure rate when compared with dental implants. This failure rate especially depends on the specific anatomical region where they are placed. Especially after resection, having enough bone volume may not always be found. A patient's ability to insert and extract the prosthesis, his ability to clean the tissue around implant, and the necessity of implants being in the borders of the prosthesis to be placed may create problems regarding the implant implementation when combined with limitations in bone volume. Most maxillofacial defects occur as a result of cancer surgeries, and, generally, radiotherapy assistance is needed after resection in those cases. This affects the short and long term success of craniofacial implant implementation. In his study, Nishimura determined the success rate of implants implemented in supra-orbital edges after radiation as 33%. Functional loading factors are important factors for the long term success of implants. The transfer of force coming from implants to hard tissues creates a warning as remodeling or modeling. If the tensions around the implant exceed physiologic limits, the relation of the interface of bone and/or bone implant and the implant would be inevitably lost. For preparation of a comfortable upper structure and the ability of patient to clean the

implant region, the distance between implants should be at least 10mm. Because of inadequate bone volume, implants cannot be placed in locations with equal distances and appropriate positions. This can cause problems in the preparation of upper structures and prostheses [1-13]. We can summarize the factors which affect the success or failure of maxillofacial implants:

a. Bone volume and quality: this relationship is directly proportional. The dimensions of implants to be placed in bones must be determined in accordance with existing bone volume. When bone volume increases, longer and wider implants can be placed. As a result of studies, it is recommended that 3mm length implants should not be used. The inadequacy of compact bone may cause failure of implants by causing lack of primer stability. The mastoid process is a bone region of the facial skull where the bone quality and volume is good and adequate. There are dense compact bones in the edges of orbita and it affects stability in positive way. However, the volume of orbital edges is limited. Because most of the bones consist of compact bone, the lack of blood build-up and nutrition negatively affect implant success.
   Because the nasal bottom consists of loose trabecular bone, it negatively affects primer stability.
b. Hygiene: the tissue fluids in defect regions may accumulate and create dermatitis. That accumulation is seen most frequently in eye prostheses because there is a low possibility of a patient seeing the region with his single eye and to provide hygiene. The accessibility of the region is important and necessary for a patient's motivation and hygiene. Dermatitis may cause implant losses in upcoming periods. The handcraft and motivation of the patient is very important for providing adequate hygiene.
c. Radiation therapy: the effect of radiotherapy on implant success must be discussed. The dose of radiation, the implementation of hyperbaric oxygen treatment, the duration between radiotherapy and implant surgery, prosthetic design, and soft tissue status are important.

Discussion

All other treatment options must be discussed before surgery. If the rehabilitation via a prosthesis reinforced by implant is considered after surgery, soft and hard tissues in the surgery region must be prepared for implant placement. The bone regions which are important for the placement of Osseo-integrated implants should be protected as much as possible or they must be resized via various reconstructive procedures in accordance with implant placement. The thickness and mobility of soft tissues at the edge of defects are very important, especially for achieving aesthetic results. Because of the muscle movements in the face, the appearance of maxillofacial prosthesis around defects, where tissues move, causes various problems. As a result of these issues, the ideal indications of implant reinforced prosthesis are prosthetic treatments of auricular, nasal, and orbital resections. In order to prevent inflammatory reactions, thin and smooth tissue must be created around implants.

Conclusion

Maxillofacial defect treatment must be handled individually and implants must be placed on appropriate positions with enough bone volume. In order to measure easier, implants should be placed in a parallel fashion. The extension of prosthesis borders increases the reinforcement and retention of the prosthesis. Preferably, the edges of the prosthesis should extend to tissues with less mobility.

References

[1] Asar, N. V., Yazıcıoğlu, H., Yaluğ, S. & Yılmaz, C. (2008). Implantsupported facial prostheses. J of Gazi University Faculty of Dentistry,25, 41-49.

[2] Gitto, C. A., Plata, W. G. & Schaaf, N. G. (1994). Evaluation of the periimplant epithelial tissue of percutaneous implant abutments supportingmaxillofacial prostheses. Int J Oral Maxillofac Impl, 9, 197-206.

[3] Jacobsson, M., Tjellstrom, A., Fine, L. & Anderson, H. (1992). Aretrospective study of osseointegrated skin-penetrating titanium fixtures used for retaining facial prostheses. Int J Oral Maxillofac Implants, 7,523-528.

[4] Karakoca, S., Aydin, C., Yılmaz, H. & Bal, B. T. (2010). Retrospectivestudy of treatment outcomes with implant-retained extraoral prostheses: survival rates and prosthetic complications. J of Prosthet Dent, 103, 118-26.

[5] Leonardi, A., Buonaccorsi, S., Pellacchia, V., Moricca, L. M., Indrizzi,E. & Fini, G. (2008). Maxillofacial prosthetic rehabilitation usingextraoral implants. J Craniofac Surg, 19, 398- 405.

[6] Nishimura, R. D., Roumanas, E., Sugai, T. & Moy, P. K. (1995).Auricular prostheses and osseointegrated implants: UCLA experience. Jof Prosthet Dent, 76, 553-558.

[7] Shields, C. L., Shields, J. A. & Potter, P. (1992). Hydroxyapatite orbitalimplant after enucleation.

[8] Experience with initial 100 consecutive cases.Arch Ophthalmol, 110, 333-8.
[9] Taylor, T. D. (2000). Clinical Maxillofacial Prosthetics. Illinois;Quintessence Publishing Co. Inc.
[10] Tjellström, A., Yontchev, E., Lindström, J. & Branemark, P. L. (1985).Five-years˝ experience with bone-anchored auricular prostheses.Otolaryngol Head Neck Surg, 93, 366-372.
[11] Tolman, D. E. & Taylor, P. F. (1996). Bone-anchored craniofacialprosthesis study. Int J Oral Maxillofac Impl, 11, 159-168.
[12] Van Blitterswijk, C. A., Hesseling, S. C., Grote, J. J., Koerten, H. K. &de Groot, K. (1990). The Biocompatability of hydroxyapatite ceramic. JBiomed Mater Res, 24, 433- 42.
[13] Wilson, M. W., Wobig, J. L. & Dailey, R. A. (1998). Infection of aporous polyethylene orbital implant with Capnocytophaga. OphthalPlast Reconstr Surg, 14, 398-402.
[14] You, J. R., Seo, J. H., Kim, Y. H. & Choi, W. C. (2003). Six cases ofbacterial infection in porous orbital implants. Jpn J Ophthalmol, 47,512-8.