

PROSPECTS OF DENTAL IMPLANTS IN PATIENTS WITH CURED ORAL MALIGNANCIES

Nadeem Yunus

Associate Professor, Department of Prosthodontics, Jamia Millia Islamia, India
E-mail: nadeemyunus2@gmail.com

ABSTRACT

Background: In recent times the oral cancer therapy of head and neck region has improved a lot and hence the survival rate of oral cancer patients has also been improved. The associated radiotherapy uses to worsen the cases by causing xerostomia, salivary gland dysfunction, muscle fibrosis, osteoradionecrosis etc. Hence the Prosthodontist rehabilitation of these patients with conventional removable prosthesis becomes very difficult.

The use of dental implant in these patients can improve the prognosis of the prosthetic treatment. But the use of dental implants in irradiated jaws is thought to be contraindicated. The present article explains the feasibility and scope of dental implants in oral cancer patients.

Aim: The objective of this paper is to review the studies related to prognosis of dental implants in cured oral cancer patients.

Material & Methods: Various studies and reports related to the factors affecting the success of an implant in irradiated bone are studied. Different clinical studies and research done on Osseointegration of implants in irradiated patients are searched using PubMed.

Conclusion: Variety of factors e.g. material of implant, dose of irradiation, timing of implant placement and loading etc influence the success of the implants in irradiated patients. Keeping these factors in mind during diagnosis and treatment planning will definitely enhance the success rate of the rehabilitation of irradiated patients with dental implants.

Key Words: Dental implants, Radiation dose, Osseointegration, Hyperbaric oxygen.

INTRODUCTION

Conventional prosthetic treatment of defects formed after surgical treatment and radiotherapy of head and neck cancer is very difficult for a Prosthodontist. Treatment of these patients with tissue supported dentures has poor prognosis. Due to loss of jaw bone and teeth, lack of saliva and loss of stretch ability, the prosthesis gets poor support and retention. Scaring of tissues, sulcus obliteration, jaw deviation and decreased mouth opening are common features after the jaw resection, especially in mandibular jaws, which limit the stability and success of the final prosthetic rehabilitation. There are various factors which influence the success rate of the implants, if kept in mind; successful rehabilitation of irradiated patients with implant supported prosthesis can be achieved¹.

Factors affecting prognosis of dental implants in irradiated patients: Various factors like material of implants, use of hyperbaric oxygen, site and time of implant placement etc. if kept in mind and considered may help in the success of the dental implants in oral cancer patients. These factors are:

Primary or secondary placement of implants: Primary placement of the implants refers to the implant placement during ablative surgery i.e. before radiotherapy and secondary implant placement refers to implant placement after surgery & radiotherapy. Primary placement of implant shows more predictable Osseointegration (97%) as compared to

the secondary placement of implants after radiotherapy.^{2,3}

Material of implant: Titanium is the most common implant material which has been used for different studies in cancer patients and is reported to show good Osseointegration.⁴ Among these, hydroxyapatite coated implants are found to be the most successful due to their rough surfaces and osseointegrative properties.⁵

Success rate of advanced implant surfaces like plasma sprayed, sand blasted and acid etched surfaces and different implant materials like Zirconia, is still not known in irradiated bones. Further studies are required in this field.

Site of Implant Placement: In a study Nishimura et al observed that in most of the patients symphyseal region does not receive any radiation during radiotherapy; and the implants which were placed in irradiated symphyseal region confirmed a satisfactory success rate of 94-100% with decreased risk of osteoradionecrosis.⁶

Time of Implant Placement: Jacobson et al recommended that there should be a gap of at least 1 year between completion of radiotherapy and implant placement.⁷ Wagner et al favors an interval of 1.5 years between radiotherapy and implant placement.⁸ While Taylor et al and Frenzen et al believe that there should be a waiting period of at least two years between radiotherapy and implant placement.⁹

According to Dholam et al, one year time interval as recommended by Jacobson seems to be logical as this period facilitates the tissue to recover from the immediate side effects of radiation.¹⁰ This waiting period is also essential for bone remodeling and setting of vascularization.

Generally implant loading and abutment placement is done after 3 to 4 months of implant placement in normal patients.¹⁰ But according to Taylor et al,⁹ bone healing and Osseointegration in irradiated patients occur at slower rate; hence the loading of the implants should be delayed to 6 months. This extra time period helps in achieving uninterrupted Osseointegration.

Radiation dose: Colella et al reviewed implants in irradiated patients and concluded that the patients who received the radiation dose lower than 45 Gy had 100% implant success rate.¹²

Source of irradiation: Most of the studies used Co⁽⁶⁰⁾ as a source of radiotherapy. However higher energy radiotherapy protocols and superfraction have been developed now a days, effect of which on Osseointegration is still not known and further studies are required in this regard.

Use of Hyperbaric oxygen (HBO): Effect of HBO on Osseointegration of the implant in irradiated patients is still a controversial subject. Some researchers are in favor of its use and some are against of its use. Marx,¹³ Larsen and Arcuri are in favor of HBO while Keller¹⁴ and Schoen et al are against its use.

Experimental researches regarding the effect of HBO therapy in previously irradiated patients are scarce hence more research is necessary for final conclusion.

Retention mode and type of the Prosthesis: Gosta et al performed a study and concluded that highest survival rate among different type of prosthesis was for fixed retention and lowest survival was for the combination clasps and magnets on extended arms probably related to cantilever effects.¹⁵

Cuesta-Gil et al advocate use of implant retained over denture in most cases.¹⁶ They told that these prostheses facilitate better occlusal contacts, require less number of implants, assist in maintaining gingival hygiene and are less expensive.

Effect of Smoking: Smoking has a negative effect on osseointegration.¹⁷ Vasoconstriction and vascular damage due to smoking cause decrease in vascular supply leading to implant failure. It is recommended that the patient should follow a smoking cessation protocol before implant placement. The irradiated patients who continue to smoke are considered as absolute contraindication for implant placement.

Length of the Implant: Implant length affects the survival of the implant. It is found that the short implants (3-7mm) failed to a higher proportion than the longer implants in irradiated patients.¹⁵

Type, size, stage and metastasis of tumor: Gosta et al found in their study that there is no correlation between tumor size, type, stage, involvement of nodes or metastasis or region and implant failure.¹⁵

Type of Bone Graft: Werkmeister et al advocate not using non vascularized bone graft in irradiated areas where implant placement is planned.¹⁸ Hence vascularized bone grafts are recommended at the insertion site of implants in irradiated patients.

DISCUSSION

Oral cancer patients require services of different kinds of experts like surgeons, medical oncologists, radiation specialists, dental specialists and associated health specialists. Surgery is a common modality in oral cancer treatment which is associated with radiotherapy. After surgical resection, defects can range from a small deformity to a large defect with loss of significant amount of maxilla and mandible. The larger defects usually need reconstruction with hard and soft tissue grafts. In these conditions the dental implants play a major role in providing stable platform for the prosthesis. The success of these dental implants in cured oral cancer patients depends on the various factors.

Schepers and Schoen recommend placement of implants immediately after ablative surgery.^{2,3} According to them, also, there are some disadvantages associated with primary placement of implants, these include:

1. Risk of improper implant positioning.
2. Risk of interference with or delay of oncological therapy including radiotherapy.
3. Development of post treatment complications.

But, these disadvantages are of minor importance in comparison to the increased risk of injurious tissue reactions in case of post radiotherapy implantation.

Various studies have been done on titanium implants.⁴ The hydroxyapatite coated titanium implants are found to be most successful mainly due to their irregular surface and the osseo conductive properties.⁵ Advanced implant surfaces like titanium plasma sprayed, sand blasted and acid etched etc have shown good results in normal bones but long duration studies and evaluation are still obligatory to critic their survival rate in irradiated bones.¹⁰

As far as timing of the implant placement after radiotherapy is concerned, one year time interval is recommended by Jacobson and Dholam et al. This time interval seems to be logical as this period facilitates the tissue to recover from the immediate side effects of radiation and to establish vascularization.¹⁰ Lower radiation dose is recommended for the success of the implants, it has been observed that the patients who received a dose of lower than 45 Gy had 100 % success rate.¹²

Use of the hyperbaric oxygen is a controversial subject some researchers are in its favor and some are against it. Further long term study is required in this field.

As established earlier smoking is absolute contra indication for any surgery. Likewise, the smoking should be avoided in case of implant placement also.

CONCLUSION

This above discussion reveals that radiotherapy should not be considered as an absolute contraindication for implant therapy. Patients treated with radiation in the head and neck region can be effectively rehabilitated with dental implants. If the following factors are considered, the success rate of implant therapy in irradiated patients will be increased:

1. Insertion of implants after one year of radiation.
2. Placement of minimum number of implants. (Prosthesis can be fabricated on 2 implants)
3. Insertion of implant in vascularized bone grafts.
4. Hydroxyapatite coated titanium implants should be choice of implants.
5. Radiation dose not exceeding 45 Gy.
6. Implant success rate is higher in mandibular symphyseal region and least in frontal bone.
7. Tumor size, location, stage and metastasis and experience of the surgeon do not affect implant success.
8. Longer implants have better prognosis.

REFERENCES

1. Nadeem Y. Scope of dental implants in irradiated jaws in oral cancer patients. *Journal of oral biology and craniofacial research*. 2014;4:49-58.
2. Schepers RH, Slagter AP, Kaanders JH, van den Hoogen FJ, Merks MA. Effect of postoperative radiotherapy on the functional result of implants placed during ablative surgery for oral cancer. *Int J Oral Maxillofac Surg*. 2006;35:803-8.
3. Schoen PJ, Raghoobar GM, Bouma J, Reintsema H, Burlage FR, Roodenburg JL, et al. Prosthodontic rehabilitation of oral function in head-neck cancer patients with dental implants placed simultaneously during ablative tumor surgery: An assessment of treatment outcomes and quality of life. *Int J Oral Maxillofac Surg*. 2008;37:8-16.
4. August M, Bast B, Jackson M, Perrott D. Use of fixed mandibular implant in oral cancer patients. *J Oral Maxillofac Surg*. 1998;56:297-301.
5. Schon R, Ohno K, Kudo M, Michi K. Peri-implant tissue reaction in bone irradiated the fifth day after implantation in rabbits: Histologic and histomorphometric measurements. *Int J Oral Maxillofac Implants*. 1996;11:228-38.
6. Nishimura RD, Roumanas E, Beumer J, Moy PK, Schimizu KT. Restoration of irradiated patients using osseo integrated implants: Current perspectives. *J Prosthet Dent*. 1998;79:641-7.
7. Jacobsson M. On bone behavior after irradiation [Thesis]. Sweden: University of Gothenburg; 1985.

8. Wagner W, Esser E, Ostkamp K. Osseointegration of dental implants in patients with and without radiotherapy. *Acta Oncol*. 1998;37:693-6.
9. Taylor TD, Worthington P. Osseo integrated implant rehabilitation of the previously irradiated mandible: Results of a limited trial at 3 to 7 years. *J Prosthet Dent*. 1993;69:60-69.
10. Dholam PK, Sandeep VG. Dental implants in irradiated jaws: A literature review. *Journal of Cancer Research and Therapeutics*. 2012; 8:Suppl.2:S85-93.
11. Branemark PI, Hansson BO, Adell R, Breine U, Lindström J, Hallén O, et al. Osseo integrated implants in the treatment of the edentulous jaw. Experience from a 10-year period. *Scand J Plast Reconstr Surg Suppl*. 1977;16:1-132.
12. Colella G, Cannavale R, Pentenero M, Gandolfo S. Oral implants in radiated patients: A systematic review. *Int J Oral Maxillofac Implants*. 2007;22:616-22.
13. Marx RE. Osteoradionecrosis: A new concept of its pathophysiology. *J Oral Maxillofac Surg*. 1983;41:283-8.
14. Keller EE. Placement of dental implants in the irradiated mandible: A protocol without adjunctive hyperbaric oxygen. *J Oral Maxillofac Surg*. 1997;55:972-80.
15. GostaGranstrom. Osseointegration in irradiated cancer patients: an analysis with respect to implant failures. *J Oral Maxillofac Surg*. 2005;63:579-585.
16. Cuesta-Gil M, OchandianoCaicoya S, Riba-García F, Duarte Ruiz B, Navarro Cuéllar C, Navarro Vila C. Oral rehabilitation with osseo integrated implants in oncologic patients. *J Oral Maxillofac Surg*. 2009;67:2485-96.
17. Bain CA. Smoking and implant failure--benefits of a smoking cessation protocol. *Int J Oral Maxillofac Implants*. 1996;11:756-9.
18. Werkmeister R, Szulczewski D, Walteros-Benz P, Joos U. Rehabilitation with dental implants of oral cancer patients. *J Craniomaxillofac Surg*. 1999;27:38-41.