ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 9, Issue, 04, pp.49313-49316, April, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

CASE STUDY

RADIATION CARRIERES: PREVENTIVE APPROACH FROM RADIATIONS DURING CHEMOTHERAPY

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ARTICLE INFO

Article History:
Received 17th January, 2017
Received in revised form
15th February, 2017
Accepted 26th March, 2017
Published online 30th April, 2017

Key words:

Radiation carriers, Radiation therapy, Radiation prosthesis, Brachytherapy, Computerised Axial Tomography Scan, Rapid Prototyping.

ABSTRACT

Radiation therapy is used as a single modality in the curative treatment of early stage head and neck cancer or as a part of multimodality therapy in the curative treatment of locally advanced head and neck cancers. Adverse tissue reactions associated with the use of radiotherapy in the management of patients with head and neck cancer are painful and they diminish the quality of life, often discouraging the patient from taking treatment. RADIATION CARRIER works as a boon for these patients. It is an ancillary prosthesis used to administer radiations to the confirmed areas by the means of capsules, beads or needles of radiation emitting materials such as radium, iridium or cesium. Its function is to hold the radiation source securely in the same location during the entire period of treatment. Fabricating customized radiation carriers for inaccessible areas, such as the nasopharyngeal space, requires the patient to be under conscious sedation or general anaesthesia to allow impressions for indirect processing techniques. This article highlights on newer advancements and various types of radiation carriers.

Citation: Dr. Neha Hakepatil, Dr. Nilesh Bulbule and Dr. Amit Jagtap, 2017. "Radiation carrieres: Preventive approach from radiations during chemotherapy", *International Journal of Current Research*, 9, (04), 49313-49316.

INTRODUCTION

In India, about 40% of the cancers are found to be oral cancers. These patients with head and neck cancers receive radiotherapy at some point during the course of their treatment. In recent years, biologically equivalent doses have been escalated in order to achieve higher results for local regional control. There is also an increase in postoperative doses, they have been increased from 50Gy to 60Gy. These doses are given in combination with chemotherapy (Johnbeumer *et al*.). As a result there is an increase in the incidence and severity of preradiation and postradiation morbidity. The role of the dental clinician is to minimize the postoperative morbidities associated with oral function that affect the patient's quality of life.

Methods of radiation delivery

The radiation delivery rate is1.8 Gy to 2 Gy per fraction. Different modalitiesthat are used for delivery of radiotherapy are:

1.**External radiation therapy (External Beam Radiation)**: also known as ***teletherapy*** is used in delivering high doses of radiation to the tumours which are located 6 cms within the skin surface. These doses range from 6500 rads to 7500 rads for 6-7 weeks (Mantri and Bhasin, 2010).

2.**Interstitial Radiation therapy (Internal Beam Radiation)**: also known as ***Brachytherapy*** is used in delivering doses upto 20000 rads over a shorter distance for a shorter time period ie 10-15 hrs.

3.**Modern Radiation therapy:** Use of computerized treatment planning along with use of modernized radiation treatment machines is being done in order to deliver high precision radiations. The newer technologies include –

- 3D Conformal Radiation (3DCRT)
- Intensity Modulated Radiation Therapy (IMRT)
- Image Guided Radiotherapy (IGRT)
- Tomotherapy
- Rapid Arc Therapy

Adverse effects of radiation therapy

The adverse effects from radiation therapy can be lethal (irreparable) or sublethal. Adverse tissue reactions associated with the use of radiotherapy in the management of patients with head and neck cancer are painful and they diminish the quality of life, often discouraging the patient from taking treatment. The adverse effects include:

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1.General tissue effects of radiation:

[I] Immediate effects

1- Epithelium: a) Histological picture: epithelium is pale, thin, low keratin, decreased vascularity and increase fibrous fibers.
b) Prosthetic problems: long time ulcers intolerable prosthesis.
2- Buccal mucosa: a) Vasodilatation of blood vessels.
b) Inflammation of submucosa.
3- Lip, cheek and tongue: a) Sloughing of the mucosa.
b) Overgrowth of candida.
c) Increase sensitivity to spicy, hot and cold food.
4- Salivary glands: decrease saliva - Xerostomia.
5- Skin: redness, swelling and erosion.
6- Corner of the mouth - angular chelitis.
7- Eyes: Conjunctivitis.
8- Weight loss and dyspnea.

[ll] Delayed effects

1- Salivary glands: a) Decreased amount of saliva.
b) Increased viscosity of saliva.
c) Decreased the PH of saliva.
d) Difficulty in swallowing.

Prosthetic effects: The patient can't tolerate his prosthesis due to more friction during function as saliva acts as an effective lubricant. Retention is compromised, as the peripheral seal may be difficult to obtain.

2- Eyes: Damage to eye lenses - Cataract.
3- Teeth and Periodontal ligaments: a) Decalcification.
b) Sensitivity.
c) Destruction of tooth bud.
d) Arrest teeth growth.
4- Tongue and mucosa: partial and complete loss of taste.
5- Diet: loss of appetite, nausea and pain.
6- Skin: Erythema, ulceration and pigmentation.
7- Bone: Maxillary bone effect is more than the mandibular due to more radiation
absorption - osteoradionecrosis.
8- Trismus:
9- Edema.

Radiation prosthesis

Radiation prosthesis can be defined as any device artificially fabricated that aids in the efficient administration of radiotherapy to the affected areas and thereby helps in limiting the post therapy morbidity. These devices shield the vitalstructures duringtreatment, positions the beam, carry the radioactive material to the tumor site and recontour the tissue (Mantri and Bhasin, 2010).

They can be classified into three groups:

1) Positioning Stent
a) Perioral cone positioning stent
b) Tongue depressing stent

2) Shielding Stent
a) Tissue recontouring stent
b) Tissue bolus compensators

3) Radiation Carriers Incorporated With Radioisotopes
a) Preloaded carriers
b) Afterloaded carriers

Materials used for fabrication of radiation prosthesis

Heat cure acrylic resin, tin foil and wood's metal (cerrobend alloy) (Mantri and Bhasin, 2010).

Radiation carrier

Radiation carrier is a type of radiation prosthesis. It is an ancillary prosthesis used to administer radiations to the confirmed areas by the means of capsules, beads or needles of radiation emitting materials such as radium, iridium or cesium. Its function is to hold the radiation source securely in the same position during the entire course of treatment. Radiation carriers are of two types:

1. Preloaded Radiation carrier
2. Afterloaded Radiation carrier

Preloaded Radiation carrier:

The radiation source is loaded before the carrier is placed intraorally into its position. "Figure 1"

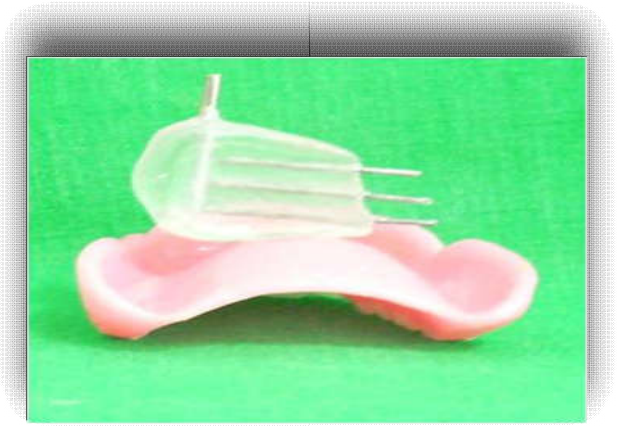

Figure 1.

Afterloaded Radiation carrier: The radiation source is embedded once the carrier is placed in its position. "Figure 2"

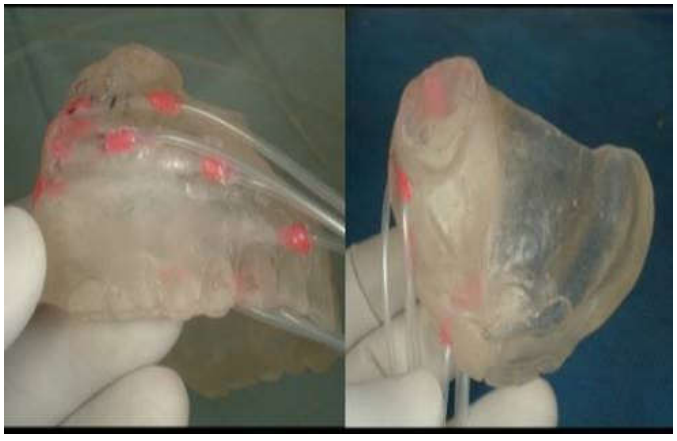

Figure 2.

Both the types of radiation carriers are generally used in treatment of accessible superficial oral lesions like palatal or buccal mucosal lesions. But after loaded radiation carriers are seen to be more advantageous than the preloaded radiation carriers as the radioactive sources are placed after the carrier is in position. This helps in reducing the exposure of the personnel handling, securing and positioning such devices from radiation (JayantPalaskar *et al*., 2016). The radiotherapist determines the exact location and number of sources and the markings are transferred on the dental model. They are used to carry the radiation sources close to the site of treatment (intracavitary) or directly into the tumour (interstitial) (Mantri and Bhasin, 2010). It is indicated in Brachytherapy.

Brachytherapy is a method of radiation treatment in which sealed radioactive sources are used to deliver the dose from a short distance by interstitial (direct insertion into the tumor) or intracavitary (near the tissue) or surface application. The doses are 6500-7500 rads for 6-7 weeks. These interstitial devices (brachytherapy) are used in delivering high dose radiation for a short period of time, i.e. 10-15 hours (Goswami *et al*., 2013). Interstitial devices are used to encapsulate radiation source (needles, narrow tubes or seeds containing radioactive cesium, cobalt, gold or iridium) within the tumour or very close to the affected area (Kasat *et al*., 2010).

Two-piece radiation carrier: The prosthesis consists of a two-piece radiation carrier device consisting of radium needles. . Once the radiotherapist gave the position of the lesion and the first stent desired field of radiation on the maxillary cast. Cast is used to fabricate the first stent. Space is provided to this radium needles by constructing grooves on this stent "Figure 3a". Another stent is attached to this first stent via snap attachment (magnets, buttons, etc.) "Figure 3b". The advantage of this prosthesis is that the radium needles are held securely between the two stents and can be comfortably worn by the patient for the required time without dislodgement of the needles (Kabcenell, 1980).

Fig.3a

Fig.3b

Radiation carrier device for edentulous mandible: This prosthesis consists of a denture base containing radium needles for the required sites. (JayantPalaskar *et al*., 2016) "Figure 4".

Afterload radiation carrier device: Hollow catheters were provided in the prosthesis, in predetermined locations. Once the carrier is positioned, threading of radioactive isotopes are done in the hollow tubing, allowing for quick radiation. The advantages of afterload over preload technique (the above two prostheses), is that, in preload carrier, the radioactive source is positioned within the prosthesis before the carrier is inserted. This method creates urgency of placement of the prosthesis because the staff members are exposed to potentially hazardous radiations while performing the procedure (Derhei *et al*., 2003) "Figure 5".

Figure 4.

Figure 5.

These carriers are also used in the treatment of the inaccessible areas such as nasopharyngeal spaces. But the fabrication of carriers for these areas is difficult as the patient needs to be under conscious sedation or general anaesthesia during impression making for indirect processing techniques. In-order to overcome these shortcomings, newer advancements have been made, which includes:

a) Computerised Axial Tomography Scan
b) Rapid Prototyping

Computerized axial tomography scan

Tomographic images of specific area of the screened object are produced by using computer processed X-Rays (Satish Gupta *et al*., 2015).

Rapid prototyping

Rapid prototyping is used for designing and fabricating an extra–oral radiation shield. The application helps in providing an easy, standardized, more precise and comfortable approach for patients to deliver radiations to the face. Computerized 3-dimensional (3D) data is used to construct physical models. The primary advantage of this process is that the model created directly retains all the detail of the internal geometry rather than just the outer surface contours (Satish Gupta *et al*., 2015).

Summary

The incidence & prevalence of head & neck cancer with the change in lifestyle has changed a lot over a period of years. There has to be even more majors to control the cross radiation in such patient. This is to prevent further functional & esthetic disabilities in such patients. Hence these majors in form of radiation carriers to protect these patients from cross radiation along with other majors are must. Here we have presented an overview over the various aspects of radiation carriers & their utility.

REFERENCES

(Gp. Capt.) Satish Gupta, Shailesh Jain, BhumikaSardana, NishantGaba. (Customized Radiation Prostheses – A Preventive Approach For Head & Neck Radiotherapy). *Indian Journal of Dental Sciences*, June 2015, Issue:2, Vol.:7;126-129.

Derhei, P. M., Lim, W. C., Timmerman, R. D. and Andres, C. J. 2003. (Use of computed tomography for fabrication of a custom brachytherapy carrier: A clinical report). *J ProsthetDent.,* 89(1):15-18.

Dr. JayantPalaskar, Dr.Zankhana S. Mody, Dr.Shreyas S. Mohile, Dr.Jyoti H. Wankhade, Dr.Sayali R. Kordeand , Dr. Nikita M. Virdiya, 2016. ("Different types of Radiation Prostheses to minimize radiation side-effects"). *International Journal of Current Research*, 8,(06), 33568-33574.

Goswami, R., Agarwal, K. and Gaba, N. 2013.(Prosthetic Carriers for Radiation Therapy of Head and Neck). *BritishBiomedical Bulletin,* 1(2):136-146.

Johnbeumer III, Mark T. Marunick, Salvatore J. Esposito. Maxillofacial Rehabilitation Prosthodontic and Surgical Management of Cancer-Related, Acquired, and Congenital Defects of the Head and Neck. 3rd ed., Quintessence Publishing Co, Inc. pg.1-60

Kabcenell, J. L. 1980. (A two piece radiation therapy surface mold). *J Prosthet Dent*., 43(1):86-88.

Kasat, V., Sahuji, S. and Joshi, M. 2010. (Radiotherapy: An update). *JIAOMR*, 22(4):26-30.

Mantri S S, Bhasin A S. (Preventive prosthodontics for head and neck radiotherapy). Journal of Clinical and Diagnostic Research [serial online] 2010 August \[cited: 2010 August 31]; 4:2958-2962.

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