A Customized Mould Brachytherapy Appliance

Abstract
Mould brachytherapy is short distance radiation delivery via custom fabricated carrier device known as mould. This report describes the fabrication of customized brachytherapy appliance for a 70yr old patient having carcinoma of the tongue.

Key Words: Brachytherapy; Mould Brachytherapy Appliance; Catheters; Carcinoma of Tongue.

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Introduction
Brachytherapy is a method of radiotherapy in which sealed radioactive sources are used to deliver the radiation dose within short distance by direct insertion into the tissue, placement within a cavity, or surface application. Mould brachytherapy is delivering ionizing radiations via a carrier device known as mould. It is usually delivered by custom fabricated carrier, designed to provide a more constant and reproducible geometry for source positioning. Appliance is customized to fit the patient in a comfortable, reproducible, stable and retentive manner. The purpose of this report is to describe a method of fabricating a stable and a comfortable appliance to ensure delivery of therapeutic radiation to the lateral border of the tongue.

Case report
A 70yr old female patient who reported to the Medical College Hospital, VIMS, Bellary, India with a history of long standing ulcer on the tongue. On clinical examination an ulcer was seen on the left lateral aspect of the tongue measuring about 4x3cm in dimension with 2 palpable left submandibular lymph nodes. Biopsy and histopathological finding’s confirmed a well differentiated squamous cell carcinoma with nodal metastasis. The patient was staged as T3N1M0. After external beam radiotherapy; surface mould brachytherapy was planned and referred to Dept. of Prosthodontics, Government dental College, Ballery, India for the fabrication of customized brachytherapy applicator (Mould).

Fabrication of customized brachytherapy mould:
Patient was asked to rinse his mouth with betadine solution before making the impression. Left lateral border and the base of the tongue was the area to be irradiated. To achieve this, the impression taking was modified as follows. The tip of the tongue was held with a gauze piece and was displaced to the right side. Disposable syringe was used to inject irreversible hydrocolloid between the tongue and the cheek prior to seating of the sectional tray loaded with the irreversible hydrocolloid material. The impression was retrieved carefully and was poured in dental stone in two sections.

The position of the after loading catheters was determined by the radiation oncologist and was secured in place on the stone cast with sticky wax. Auto polymerizing acrylic resin was adapted to form a template to hold the catheter in position. After curing the rough edges were smoothened and polished. This template was inserted into the patient’s mouth and silicone rubber base impression material was adapted on both the lateral and superior aspects to obtain an adequate thickness so as to displace the normal tissues away from the radiation site and stabilize the template while still maintaining the comfort of the patient. Before brachytherapy began, the template (Fig 1) was inserted into the patient’s mouth and the excess material was trimmed to ensure the stability of the mould throughout the treatment procedure. The appliance was positioned in the patient’s mouth with dummy sources for simulation, and the final dosimetry was calculated by the radiation therapist. The appliance was after loaded with cobalt 60 remote after loading HDR Brachytherapy unit.

Fig1 Acrylic template with the catheters
Discussion

Oral carcinomas accounts for 5-7% of all carcinomas. In addition to the everlasting potential patient population being treated surgically, the use of radiotherapy, chemotherapy, and cryosurgery is now more common among the adjunctive forms of treatment used in the management of head and neck carcinomas.(2) Brachytherapy is an important treatment modality available to clinicians for the management of patients with tongue cancers. The advantages of this strategy is that surgery is avoided, thereby preserving the normal structure and function of the oromasticatory complex.(3) A rapid fall of dose around the radioactive source making it possible for increased tumor control while sparing the surrounding tissue and a short overall treatment duration which reduces the risk of tumor repopulation.(2) During this short span, it is important that the catheter remain in the exact position determined by the radiation oncologist.

Dose and duration of radiotherapy: For this patient external beam radiotherapy of 50Gy was planned in 25 fractions. The dose was divided as 200cGy for 5days a week. The total duration of treatment was 5 weeks. This took care of the gross tumor and lymph nodes after which brachytherapy were planned. Dose of brachytherapy was 16Gy in 4 fractions. The dose was divided as 4Gy/fraction in 6 hrs gap and treatment duration was 24 hrs.(4) The main advantage is the short duration period. During this short span, it is important that the catheter remain in the exact position determined by the radiation oncologist. Earlier gauze compressors were used which is not a reliable method of securing the catheters. Hence a customized device has to be fabricated to prevent most of post radiation morbidity ensuring minimal radiation to unaffected surrounding tissues and maximizing radiation directly to specific sites.

Types of radiation prostheses: Carrier prostheses for holding radioactive sources or radiation beam cones (positioning stents), prostheses for displacing normal tissues, prostheses for protecting radiosensitive tissues (prosthetic shields), and prostheses for measuring radiation doses.(1-3)

Conclusion

In conclusion dentists can become a great helping hand to the radiation oncologists in improving the quality of treatment with the brachytherapy prostheses.

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