

Government of India
Atomic Energy Regulatory Board
Radiological Safety Division

Guidelines for deployment of radioactive seed sources for ocular brachytherapy

Introduction: Ocular Brachytherapy is the technique of brachytherapy used to treat eye cancers. The radioactive sources are implanted surgically in the eye and are retained till the desired dose of radiation is delivered. Applicator used in ocular brachytherapy is in the form of circular plaques (a disc with the radius of curvature similar to that of the eye) into which the radioactive sources are placed. The requisite size of the plaque is selected based on the size of the tumor. The sources are either pre-fabricated into the plaque or have to be manually affixed to the plaque. Iodine 125 sources used for ocular brachytherapy are available as radioactive seeds that are manually affixed to the plaque. Similarly, other sources such as Sr-90 & Ru-106 are also used for this procedure.

Procedure:

The procedure involves various steps i.e, delineation of tumor, dose prescription, treatment planning, plan evaluation and approval, plaque preparation (in case it is not prefabricated), transportation of the plaque to operation theatre (OT), plaque implantation, Transportation, treatment in isolation room, plaque removal after dose delivery, patient/room monitoring and discharge of patient.

After assessing the suitability of the patient for the procedure, tumor is measured clinically using appropriate imaging systems (ultrasound, MRI or CT). Dose prescription is done by the radiation oncologist in consultation with the ophthalmic surgeon. Subsequently, treatment planning is carried out by the medical physicist and the final treatment plan is reviewed and approved by the radiation oncologist. In case the source is not prefabricated, Plaque is prepared by the Medical Physicist incorporating the seed positions as per the plan and ensuring proper fixation of seeds in the plaque. The plaque is transported to the OT in a transport container where it is sterilized and surgically implanted by the ophthalmic surgeon, after correct localization of the tumor by using a dummy plaque. Once the dummy is accurately placed over the tumor, its position is marked and the dummy is replaced by the active plaque after ensuring the correctness of the number of sources and their configuration.

During the course of treatment, the patient is kept in a separately allocated isolation room with limited access to attendees. On completion of the treatment, the plaque is removed in the OT and transferred to the storage room in the transport container after cross checking the number of seeds in the fabricated plaque.

The following guidelines are proposed for ocular brachytherapy using radioactive seed sources:

1. Layout of Installation

- 1.1 Separate room with controlled access shall be provided for source storage and preparation.
- 1.2 The OT where the procedure is performed and post operative recovery room, if any, shall be identified in the layout.
- 1.3 A separately allocated isolation room shall be provided for the patient during treatment.
- 1.4 No special shielding requirements are necessary for the OT and isolation room. It is essential that during treatment with fabricated plaques, the treated eye is shielded with a lead shield of appropriate thickness.
- 1.5 Separate safety interlocks are not required for the isolation room and OT. A removable placard with radiation warning symbol shall be placed at the door whenever patient is being treated
- 1.6 Instructions to visitors and nursing staff shall be displayed at the door of the isolation the whenever ocular patient is being treated.

2. Operational Safety

- 2.1 Source Inventory: Periodic Inventory of source shall be maintained which includes source receipt, used for treatment, removal of sources after treatment, return to source storage and return to supplier for disposal.
- 2.2 Protection level instruments: Survey meter of appropriate range shall be available in the facility.
- 2.3 Personnel Monitoring: Personnel monitoring badges shall be used by the personnel involved in the procedure.
Medical Physicist involved in the preparation of the plaque (if not prefabricated) shall be monitored by both the wrist and chest badge.
- 2.4 Patient Monitoring: Patient shall be monitored during treatment. To prevent patients from leaving the ward, a specific color coded dress may be provided to all patients undergoing ocular brachytherapy. A wrist band providing the details of the name and number of sources, activity and date of implantation and removal also may be provided for easy identification.
- 2.5 Tests for leakage and integrity: The sources shall be checked for leakage by routine swipe tests by using appropriate monitoring equipment. Integrity of the sources shall be checked by visual inspection under a magnifier
- 2.6 Application and removal of sources: Application and removal of sources shall be performed by an ocular surgeon (ophthalmic surgeon)

2.7 Treatment chart: A patient treatment chart shall be maintained for each patient as per the institutions requirement. The chart shall be signed by the ocular surgeon, Radiation oncologist and Medical Physicist.

2.8 Handling Tools (applicable if source is not prefabricated)

- a. Long forceps and tongs shall be used for handling the sources.
- b. L-bench of appropriate material and thickness shall be used during preparation of the sources. A magnifier may be used to easy visibility and handling of the sources
- c. For quick and easy preparation of the plaque, a plaque holder should be used for immobilizing the plaque during preparation of the source.
- d. The eye shall be covered with a lead shield after the implant, and which shall remain in place till the sources are removed.
- e. The posterior surface of the plaque shall be minimum of 1mm gold thickness or its equivalent

2.9 Area Monitoring: The OT and isolation room shall be monitored for any undue residual radioactivity after plaque removal. The patient shall be monitored for any undue residual radioactivity prior to discharge.

3. Personnel Requirements and responsibilities:

3.1 Radiological Safety Officer: RSO shall be a full time employee of the facility. Candidates eligible to work as RSO in Medical Radiation facilities can be nominated as RSO for Ocular brachytherapy. Further, candidates fulfilling basic qualifications given below may also be nominated by the hospital to undergo minimum one week training programme conducted by RP&AD, BARC in collaboration with R.Ph.D., BARC.

i) B.Sc with physics as one of the subjects

Or

ii) B.Sc in Optometry

On successful completion of the training programme, such candidates would be eligible to be nominated as RSO for ocular brachytherapy.

The Radiological Safety Officer shall be responsible for maintaining the source inventory, transport of sources within the hospital premises, transport of sources for disposal, maintaining personnel dose monitoring records and submitting periodic safety status reports.

3.2 Ocular Surgeon: The Ocular Surgeon shall be responsible for assessment of the patient for the procedure, delineation of the tumor by appropriate method, implantation of sources and removal of sources on completion of treatment.

3.3 Medical Physicist: Medical physicist can be a full time or part time employee of the institution. In case of part time employee, a declaration / NOC from the original employer of the Medical Physicist allowing the services of the Medical physicist to be used when required for ocular brachytherapy procedure is to be submitted. In case the above NOC is revoked or if the Medical Physicist is unwilling to provide his/ her part time services to the hospital, the same should be promptly intimated to AERB.

The Medical Physicist shall be responsible for treatment planning and preparation of the plaque according to the plan.

3.4 Radiation Oncologist: Radiation Oncologist may be a full time or part time employee of the institution. In case of part time employee, a declaration/NOC from his/her employer allowing the use of the services of Radiation Oncologist when required for ocular brachytherapy procedure is to be submitted. In case the above NOC is revoked or if the Radiation Oncologist is unwilling to provide his part time services to the hospital, the same should be promptly intimated to AERB.

The Radiation Oncologist is responsible for prescription of the dose, review and validation of the treatment plan.