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HDR Brachytherapy Treatment for Basal Cell Carcinoma

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Cancer

Cancer is a disease process that involves the uncontrollable replication of abnormal cells. These cells grow without regard to normal tissues, creating a mass of tumor cells. Of cancers, 90% arise from epithelial tissue and are classified as carcinomas (Rollins, Long & Curtis, 2022).

Basal Cell Carcinoma

Basal cell carcinoma (BCC) is a type of skin cancer that originates in the epithelial tissue, specifically within the basal cells. As one of the most common forms of cancer, BCC typically grows slowly and rarely spreads to other parts of the body. BCC lesions can cause localized tissue damage if left untreated, but they generally have cure rates between 80% and 90% overall. Lesions smaller than 3/8 inch achieve nearly a 100% cure rate (Hall Rollins, Long, & Curtis, 2022).

Radiation Therapy

Radiation therapy is one of the primary modalities used in the treatment of malignant disease. Departments are currently examining and treating approximately 75% of all patients with a new diagnosis of cancer. Radiation Therapy treats tumors or lesions by delivering cancericidal doses of ionizing radiation precisely to the tumor while limiting as much dose to healthy noncancerous tissues as possible. The preparation for treatment includes simulation, development of optimal treatment by dosimetry, and treatment delivery (Rollins, Long & Curtis, 2022).

Brachytherapy

Brachytherapy for skin cancer involves placing a radioactive source directly on or near the affected area. It is most commonly used for basal cell and squamous cell carcinomas. This method works best for small or surface-level tumors and allows doctors to target the tumor precisely while reducing exposure to nearby healthy tissue. Brachytherapy may require several sessions. The procedure has high success rates and minimizes scarring (Hovhannisyan, 2025).

HDR Brachytherapy Treatment

Surface skin high-dose-rate (HDR) Brachytherapy is an organ-sparing treatment often used for patients who are not surgical candidates. A radioactive source is placed close to the skin tumor while effectively sparing surrounding healthy tissues. This treatment allows high radiation doses to be delivered directly to the area of interest, delivering doses exceeding 12 Gy per hour, with each treatment fraction lasting only a few minutes. This method provides a non-invasive alternative to surgery while reducing the number of physical and aesthetic side effects associated with basal cell carcinoma. (Krzysztofiak et al., 2021).

A patient lies on the treatment table while a custom face mask is molded for upcoming HDR brachytherapy treatments targeting basal cell carcinoma on the left nasal dorsum. A support roll is placed under the patient's legs for comfort and proper body alignment. This step ensures precise, safe, and reproducible treatment delivery for future sessions.
(Clinical Affiliate Site, 2025a).

HDR Brachytherapy for BCC

Research indicates HDR Brachytherapy has proven to be an effective and cosmetically favorable treatment for basal cell carcinoma (BCC), particularly in high-risk facial areas. Many patients may be disqualified from surgery due to poor expected cosmetic outcomes, age, or comorbidities. HDR Brachytherapy is a valuable non-invasive, organ-sparing alternative. Additionally, the treatment is typically well tolerated, with minimal long-term side effects. Patients routinely rate the cosmetic outcome as good or very good, reinforcing HDR Brachytherapy's role as a precise and patient-friendly option for treating facial BCCs (Krzysztofiak et al., 2023).

A patient receives HDR surface brachytherapy for left nasal basal cell carcinoma. A custom mask holds their head still while a radiation applicator is carefully positioned over the lesion. A photograph is taken to document correct setup before radiation delivery.

(Clinical Affiliate Site, 2025b)

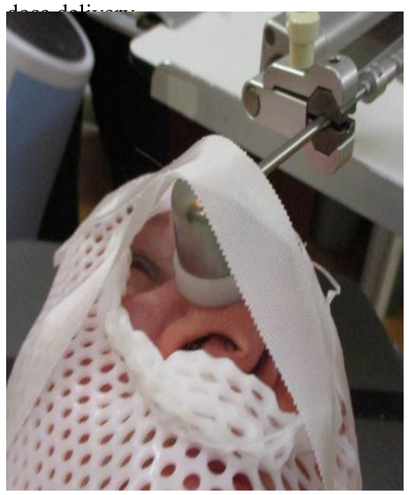
Dermoscopy

Dermoscopy is essential for monitoring treatment outcomes in patients undergoing HDR brachytherapy for BCC. This non-invasive imaging method reveals skin surface features that indicate active cancer, allowing precise assessment of therapeutic response. Studies show that HDR Brachytherapy effectively eradicates tumor cells and consistently reduces clinical and dermoscopic abnormalities during treatment. Follow-up evaluations found no residual tumor signs, confirming the therapy's accuracy, efficacy, and reputation for excellent cosmetic results, particularly in sensitive facial regions (Krzysztofiak et al., 2021; Krzysztofiak et al., 2023).

Role of the Radiation Therapists

Radiation therapists are integral members of the healthcare team who are responsible for planning and delivering precise and safe treatments for cancer patients. They play a critical role in the entire treatment process, from simulation and patient preparation to treatment delivery and documentation. During the simulation phase, therapists obtain Computed Tomography(CT) scans to localize the treatment area and construct immobilization devices that help patient remain still in the correct position. During each treatment, Radiation Therapists ensure accurate alignment, administer the prescribed radiation dose, and keep detailed records of daily and cumulative doses. Radiation Therapists also monitor the patient's physical and emotional well-being through verification of treatment parameters, patient setup, and equipment settings before beginning to ensure safety and accuracy (Rollins, Long & Curtis, 2022).

During HDR Brachytherapy, Radiation Therapists confirm the patient's identity, treatment site, and fraction number prior to treatment. They position the patient using a headrest and immobilization devices, including a facial mask, and add comfort supports as needed. After the physician marks the treatment area, therapists assist with applicator stabilization and photograph the treatment field before and after the procedure to ensure accurate and safe dose delivery.



A precisely immobilized and taped applicator is positioned over the right nasal bridge of a patient undergoing HDR brachytherapy for basal cell carcinoma. This demonstrates careful setup for safe and consistent radiation delivery.

(Clinical Affiliate Site, 2025c)

Results of HDR Brachytherapy

Results of HDR Brachytherapy treatment vary based on the tumor type, size, and treatment plan. In small localized areas, early results such as reduction in tumor size and skin healing can be seen within a few weeks. The full effects may take several months to appear, as radiation continues to impact cancer cells over time (Hovhannisyan, 2025).

Side Effects

Radiation therapy can cause noticeable skin reactions due to the high energy absorbed by the skin during treatment. Two prominent biological effects are epilation(hair loss) and erythema(reddening of the skin). Short-term side effects include , peeling, itching, dryness, and swelling. These typically appear during the first few weeks and are limited to the treatment area. Long-term effects may occur months later and can involve changes in skin color, scarring, thinning of the skin, visible small blood vessels, and ulceration. To manage these side effects, gentle skin care is recommended, including the use of non-perfumed moisturizers. Additionally, avoiding sun exposure, tight clothing and harsh soaps, and application of Aquaphor® and compresses if approved by a physician (Hovhannisyan, 2025).

Other Treatment Options

Basal Cell Carcinoma (BCC) can be treated through various surgical and local methods depending on the tumor size, location, and patient factors. Common surgical options to reduce recurrence risk include surgical removal of tissue by means of curettage and electrodesiccation, shave excision, and standard excision. Mohs surgery, a technique that removes cancer cells layer by layer, is the preferred option for treating high-risk or recurrent tumors due to its high precision. However, it is more complex than other surgical methods. For superficial BCC's, non-surgical local treatments such as cryotherapy, photodynamic therapy (PDT), topical chemotherapy, and immune response modifiers can be used. These may carry a higher chance of recurrence because they may not reach deeper cancer cells. Close follow-up is essential after these treatments. (American Cancer Society, 2023).

Conclusion

HDR Brachytherapy is considered an excellent treatment for basal cell carcinoma due to its precision and effectiveness, especially in complex anatomical areas like the nose, ears, and eyes where surgery may be difficult or disfiguring. It offers patient convenience with shorter treatment times, making it ideal for elderly patients. Studies show high cure rates of 96–98% and strong cosmetic outcomes, with up to 90% rated excellent. Brachytherapy achieves local control rates around 87% over three years. The cosmetic results are comparable to external beam radiation therapy, with about 95% of patients reporting positive outcomes as well (Hovhannisyan, 2025).

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