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Brachytherapy of Skin and Penile Cancer Workshop

Penile cancer brachytherapy

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ABSTRACT

Squamous cell cancer of the penis is an uncommon, aggressive malignancy whit an age-adjusted annual incidence of one out of every 100,000 men. Surgical amputation (penectomy) has been considered the gold standard for the treatment of penile cancer, but is associated with a high level of psychosexual morbidity. Low-dose-rate brachytherapy (BT) consists of either manually afterloaded 192Ir or pulse-dose-rate (PDR) brachytherapy provides an organ-sparing alternative, preserving penile morphology and functionality in selected patients without compromising cure.

Patients: Tumours T1 and T2 N0, up to 4 cm, strictly limited to the glans and not extended beyond the balano-preputial sulcus are most suitable for BT.

Materials: Pre-drilled Lucite templates and needles.

Implant procedure: A Foley catheter is inserted to determine the exact position of the urethra. The Paris System of dosimetry is used as a basis for designing the geometry of any individual implant to meet the requirements of tumour configuration. The distribution, spacing (median 15 mm) and total number of needles depend on tumour size. The needles are positioned in a square or rectangular array. Planes are oriented with the needles passing from the dorsal to the ventral surface of the glans. Pre-drilled Lucite templates are used for guidance of needle placement and to maintain parallelism through the duration of the implant. A Styrofoam collar is positioned around the base of the penis for support and to minimize unnecessary irradiation of adjacent structures.

Treatment planning: The gross tumour volume (GTV) includes all visible and palpable tumour. The clinical target volume (CTV) encompasses the GTV plus a safety margin of 5–10 mm. According to the Paris system, prescription is to 85% of the dose rate minima between the planes. The prescribed dose is generally 60 Gy with the treatment completed in about 5 days.

Results: Local control rates obtained with BT ranging 72–80% at 10 years. The penile preservation rate is approximately at 70% at 10 years. The two most common late complications are: urethral meatal stenosis (9–45%) and soft tissue necrosis (6–26%).

Conclusions: Interstitial brachytherapy is a relatively simple and effective treatment of penile cancer, with results similar to those obtained with surgery in T1–T2 N0 M0, with high rates of organ preservation and acceptable toxicity.

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1. Surface HDR brachytherapy in cutaneous tumours

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2. Background

The incidence of skin cancer is rapidly rising, due to population's senescence and the fashionable higher exposure to solar radiation. Treatment approach must be individualized based on patient characteristics for improving cosmetic and functional outcome. Brachytherapy constitutes an optimal option of treatment. High dose rate brachytherapy (HDR-BT) using surface applicators has shown efficacy in the treatment of NMSC and shortens the radiation treatment schedule. The use of custom-made surface moulds is a more flexible technique and allows treating irregular areas.

With the problems of waiting lists for external radiation therapy, the use of contact HDR-BT in NMSK would lead to a more intelligent use of resources.

3. Patients and materials

3.1. *Patients*

Non-melanoma skin cancer (basal or squamous cell carcinomas) as radical treatment, adjuvant therapy after surgery when margins are compromised or close, recurrent lesions after surgical procedures and localized less than 5 mm deep cutaneous T lymphoma.

3.2. *Materials*

Plastic 6 F brachytherapy catheters and cutter device, adapt thermoplastic balls for personalized applicators (custom-made moulds), standard applicators (Super Mould or Freiburg Flap by Nucletron® or similar) and dummy sources for CT-based simulation.

4. Implant procedure

Depending in locations and geometry of lesions (flat or not surface), custom-made moulds with thermoplastic balls or standard applicators are individually selected. Thermoplastic balls are heated in boiled water. A 0.5 cm width slide is firstly adapted over the tumour; brachytherapy catheters are then placed and covered with another 0.5 cm slide of thermoplastic material. If a standard applicator is used, catheters are placed inside the applicator. The tumour can be marked with a thin wire for making easy the lesion definition during simulation CT.

5. Treatment planning

A typical treatment area definition begins with an assessment of the visible surface lesion, known as the gross tumour volume (GTV). An additional margin to account for measurement uncertainty and uncertainty in applicator placement was added; this constitutes the planning target volume (PTV).

The objective of the treatment planning process for HDR-BT using the surface applicators is to cover with an optimal dose the whole PTV defined. Dose prescription varies depending on the characteristics of the patients:

- Elderly patients, with difficult mobility: hypofractionated scheme will be chosen, 500 cGy twice a week, 9–10 fractions, BED: 56–62 Gy for acute effects and 72–80 Gy, depending on the kind of treatment (adjuvant or radical) for late effects.
- Younger patients, with a higher possibility of late toxicity, standard fractionation will be chosen, 200–225 cGy five days a week, during 3–5 weeks.

6. Treatment delivery

We use a HDR-microselectrón Unit (Nucletron-Elekta®) for treatment delivery. Patient is placed in a comfortable position, applicator is placed over the PTV, safety guidewire are retired and catheters are connected with transfer tubes to the treatment unit.

7. Toxicity and results

Long-term control rates for NMSC treated with external beam radiation therapy (superficial X-rays, orthovoltage X-rays, megavoltage photons or electron beam radiation, range from 87% to 100% after a follow up of 2–5 years.

High dose rate brachytherapy with Ir-192 for NMSC has shown control rates of 92–98% after 5–10 years of follow up.

As a conclusion, clinical results are excellent in terms of tumour control. Cosmetic results are almost excellent when standard fractionation is used. With hypofractionated schemes, a slightly higher rate of telangiectasia or hypocromic areas has been reported.

Although these excellent control rates, it is frequent to experience new cutaneous tumours in sites different from treated areas, so more conservative approaches as HDR-BT are more suitable for this kind of patients.