ELSEVIER

Brachytherapy 12 (2013) 191–198

BRACHYTHERAPY

American Brachytherapy Society–Groupe Européen de Curiethérapie–European Society of Therapeutic Radiation Oncology (ABS-GEC-ESTRO) consensus statement for penile brachytherapy

Juanita M. Crook[1,*], Christine Haie-Meder[2], D. Jeffrey Demanes[3], Jean-Jacques Mazeron[4], Alvaro A. Martinez[5], Mark J. Rivard[6]

[1]*Department of Radiation Oncology, British Columbia Cancer Agency, Center for the Southern Interior, Kelowna, BC, Canada*
[2]*Department of Radiation Oncology, Institut Gustave-Roussy, Villejuif, France*
[3]*Department of Radiation Oncology, UCLA Medical Center, Los Angeles, CA*
[4]*Department of Radiation Oncology, Hôpital Pitié-Salpétrière, Paris, France*
[5]*Michigan Healthcare Professionals, 21st Century Oncology, Farmington Hills, MI*
[6]*Department of Radiation Oncology, Tufts University School of Medicine, Boston, MA*

ABSTRACT

PURPOSE: To develop a consensus statement between the American Brachytherapy Society (ABS) and Groupe Européen de Curiethérapie/European Society for Therapeutic Radiation and Oncology (GEC-ESTRO) for the use of brachytherapy in the primary management of carcinoma of the penis.

METHODS AND MATERIALS: The American Brachytherapy Society and Groupe Européen de Curiethérapie/European Society for Therapeutic Radiation and Oncology convened a group of expert practitioners and physicists to develop a statement for the use of ^{192}Ir in low-dose-rate (LDR), pulse-dose-rate, and high-dose-rate (HDR) brachytherapy for penile cancer.

RESULTS: Decades of brachytherapy experience with LDR ^{192}Ir wire and pulse-dose-rate ^{192}Ir sources for this rare malignancy indicate a penile preservation rate of 70% at 10 years postimplant. Chief morbidities remain stenosis of the urethral meatus and soft tissue ulceration at the primary site. Nonhealing ulceration can be successfully managed with various measures including hyperbaric oxygen treatment. HDR brachytherapy implant procedures are technically similar to LDR. The optimal HDR dose and fractionation schemes are being developed.

CONCLUSIONS: The good tumor control rates, acceptable morbidity, and functional organ preservation warrant recommendation of brachytherapy as the initial treatment for invasive T1, T2, and selected T3 penile cancers.

Keywords: Penile carcinoma; Interstitial brachytherapy; Low-dose-rate brachytherapy; Pulse-dose-rate brachytherapy; High-dose-rate brachytherapy

Introduction

The Board of the American Brachytherapy Society (ABS) invited a leading author in the field (JMC) to draft a statement for penile brachytherapy with international participation. CH-M was invited to coauthor the statement. Subsequently, review and input were sought from those practitioners personally known to have experience in the field (AAM, DJD, and JJM). The final draft was approved by the ABS Board of Directors and by the Groupe Européen de Curiethérapie and the European Society of Therapeutic Radiation and Oncology Council. Literature review revealed an absence of randomized studies. One multicenter retrospective review from Rozan *et al.* (1) in France and a handful of reported series from single institutions provide Level 3 evidence. Nonetheless we believe this consensus statement will provide valuable guidance.

Squamous cell carcinoma of the penis is a relatively rare malignancy in the developed world, with an incidence of

Received 6 July 2012; received in revised form 30 November 2012; accepted 10 January 2013.

* Corresponding author. Department of Radiation Oncology, British Columbia Cancer Agency Cancer, Center for the Southern Interior, 399 Royal Avenue, Kelowna, BC V1Y 5L3, Canada. Tel.: +1-250-712-3979; fax: +1-250-712-3911.

E-mail address: jcrook@bccancer.bc.ca (J.M. Crook).

1538-4721/$ - see front matter
http://dx.doi.org/10.1016/j.brachy.2013.01.167

approximately 1 per 100,000 men (2), although much higher in some third world countries being more than 4 per 100,000 in Paraguay (3), and cited as up to 1% by age of 75 years in some parts of Uganda (4). It is highly curable in its early stages. Surgical amputation (penectomy) is often the first or only treatment method considered, but traditional amputative surgery is associated with a high level of psychosexual morbidity (5–7). Surgery, however, is not the only potentially curative treatment. Organ-sparing definitive radiation therapy, with or without local resection, can provide both cure and a high rate of penile preservation. Many urologists may only see one or two cases in a lifetime of practice, so awareness of this therapeutic alternative may be limited. Because penile-sparing approaches are being used more frequently in centers with experience, referral to such centers is recommended. This review is designed to inform radiation oncologists, urologists, and other physicians about the role of radiation therapy in the treatment of carcinoma of the penis.

Patient evaluation

Carcinoma of the penis is most frequently located on the glans and prepuce (8). It occurs much more frequently in uncircumcised men, although human papillomavirus–associated cases have been reported in men circumcised as neonates (9). The first step in evaluation is to obtain a tissue biopsy, preferably deep enough to show the extent of invasion (10). Next, one must ensure full visibility of the lesion, which is often hidden under a phimotic foreskin (11). This step consists of either circumcision or a dorsal slit incision to expose the lesion, prevent soft tissue strangulation and tissue necrosis, and to promote hygiene. When possible, along with circumcision, local tumor excision can be performed to remove gross tumor and necrotic debris. These excisions must be done in a manner that preserves the cosmetic and functional integrity of the penis. Wound healing is usually adequate to allow brachytherapy to proceed within 10–14 days.

A complete history and physical examination to assess comorbidities and a workup to rule out metastatic disease are needed. Particular attention should be given to the relationship of the lesion to the urethra and the clinical status of the inguinal lymph nodes, which are the primary lymphatic drainage of the penis. Brachytherapy requires anesthesia and usually involves 5–6 days of hospitalization. The patient's general health, including cardiorespiratory status, the presence of diabetes as a risk for delayed healing, and the relative risk for thromboembolic disease should all be assessed before the procedure. Imaging should include a chest X-ray and CT scan of the abdomen and pelvis to evaluate the regional lymph nodes and rule out distant metastasis. A CT scan is especially helpful for men with higher body mass index where groin palpation is less reliable in detecting adenopathy. All cases with moderately or poorly differentiated disease, or clinical stage T2 or higher should have CT or positron emission tomography–CT staging. Clinical evaluation of the primary tumor may underestimate the depth of invasion, especially if biopsies are relatively superficial. Therefore, imaging of the penis with either ultrasound or MRI with prostaglandin-induced erection can be helpful in determining the extent of the primary tumor and its relationship to the urethra. This information can assist in brachytherapy catheter placement (12, 13).

Patient selection

The disease staging system in Table 1 is the TNM Seventh edition (2010) from the American Joint Committee on Cancer Cancer Staging Manual (14). Stage Tis, Ta, or T1a can be dealt with effectively using superficially ablative, penile-sparing modalities such as CO_2–neodymium–yttrium–aluminum–garnet (YAG) laser (15, 16). Such early superficial lesions are usually not managed with brachytherapy except in the case of recurrent or persistent disease. Tumors that are of clinical stage T1b or T2 and less than 4 cm in maximum diameter are most suitable for primary brachytherapy. Lesions confined to the glans are ideal but those with minor extension across the coronal sulcus are also suitable provided the extension can be covered with no more than one additional plane of needles. If larger lesions are treated, especially those extending into the corpora cavernosa, it must be understood by the patient and referring physicians that there is higher risk of local

Table 1
TNM primary tumor and clinical nodal staging

Tx: primary tumor cannot be assessed	Nx: nodes cannot be assessed
T0: no evidence of primary tumor	N0: no palpable nodes or visible enlargement from imaging
Tis: carcinoma *in situ*	N1: palpable mobile unilateral inguinal node
Ta: noninvasive verrucous carcinoma	N2: palpable mobile multiple or bilateral inguinal nodes
T1a: subepithelial connective tissue invasion, but no lymph vascular invasion and not poorly differentiated	N3: palpable fixed inguinal nodal mass or pelvic lymphadenopathy, unilateral or bilateral
T1b: subepithelial connective tissue invasion with lymphovascular invasion and/or poorly differentiated	
T2: corpus spongiosum or cavernosum invasion	
T3: urethral invasion	
T4: invades other adjacent structures	

Based on the American Joint Committee on cancer of penile carcinoma (2010).