ROLE OF BRACHYTHERAPY IN THE TREATMENT OF HEAD AND NECK MALIGNANCIES

ESSAY

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Abstract

Both primary and recurrent squamous cell carcinoma of head and neck cancers are classic indications for brachytherapy. A high rate of local tumor control at the cost of limited morbidity can be achieved with brachytherapy through good patient selection, meticulous source implantation and careful treatment planning.

With the aid of new technologies such as three dimensional imaging

(3D) and image guided brachytherapy it is now easier, safer and much more accurate improving the conformality of treatment.

Keywords:

Head and neck cancers, brachytherapy, three dimensional imaging (3D)

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Karim Mashhour

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List of Abbreviations

3D : Three dimensional

AAPM : American Association of Physicists in Medicine

AJCC : American Joint Committee on Cancer

BT : Brachytherapy

CI : Conformity Index

CN : Cranial nerves

CT : Computed Tomography

CRT : Conformal radiation therapy

CTV : Clinical Target Volume

DRR : Digitally reconstructed radiograph

DVH : Dose Volume Histogram

EBRT : External beam radiation therapy

FDG : Fluorodeoxyglucose

FNA : Fine needle aspiration

FOM : Floor of mouth

GEC-ESTRO : Groupe Europeen de Curietherapie- European Society of Therapeutic Radiation Oncology

GTV : Gross Target Volume

HDR : High dose-rate

HNSCC : Head and Neck Squamous cell carcinoma

ICRP : International Commission on Radiological Protection

ICRU : International Commission on Radiation Units and Measurements

IGRT : Image guided radiation therapy

IMBT : Intensity modulated Brachytherapy

IMRT : Intensity modulated radiation therapy

IOHDBT : Intra-operative high dose Brachytherapy

IORT : Intra-operative radiation therapy

IRR : Ionising Radiations Regulations

LAHNC : Locally advanced Head and Neck Cancer

LDR : Low dose-rate

LQ model : Linear quadratic model

MCD: Mean Central dose

MDR : Medium dose-rate

MRI : Magnetic Resonance Imaging

MRS : Magnetic Resonance Spectroscopy

OER : Oxygen enhacement ratio

PET : Positron Emission Tomography

PDR : Pulsed dose-rate

PTV : Planning Target Volume

RAKR : Reference air kerma rate

SCC : Squamous cell carcinoma

SPECT : Single Positron Emission Computed Tomography

TRAK : Total reference air kerma

Introduction

The overall incidence of head and neck cancer varies between countries ranging from 8 to 22% in males and from 1 to 8% in females. During the last several decades, head and neck cancer rates have been increasing, particularly between 1950 and 1970, with a slight decrease thereafter. **(Wartell et al. 1990)**

During the last fifty years, incidence of head and neck cancers worldwide was the first regarding males population and the sixth regarding the females, the mortality resulting from these cancers appears stable ; representing 9% of cancer mortality in men and 2% in women**. (Boyle et al. 1995)**

Radiotherapy is a main line of treatment that contributes to the cure or palliation of Head and Neck malignancies. Most patients present with a locally advanced disease; in this situation, radiotherapy has an important role in local control, improving survival and in relief of local symptoms. **(Dobbs et al 1999)**

Many tools are available for the treatment of Head and neck Malignancies including (Surgery, radiation therapy and concommitant chemo-radio modality) depending on the initial presentation of the disease. Radiation therapy forms are external beam radiation therapy and brachytherapy**. (Gerbaulet et al. 1999)**

Brachytherapy will continue to play an important role in the multidisciplinary approach in the treatment of head and neck cancers. **(Dutreix et al.1998)**

Brachytherapy is the delivery of radiation therapy using sealed isotopic sources which are placed as close as possible to the site to be treated. The principal advantages of brachytherapy lie in the physics of the dose distribution around a radiation source, which results in a high concentration of dose immediately around the source and a rapid fall-off of dose away from the source with distance according to the inverse square law. By implementing adequate immobilization of the area to be treated; thus eliminating the need of adding margins in radiotherapy planning to account for target mobility, it could be an ideal form of conformal treatment. **(Joslin et al 2001)**

Head & Neck Brachytherapy has a place in several key clinical situations as in:
(A) As a primary treatment of small T1 and T2 squamous cell cancers,
(B) In combination with external beam radiotherapy boosting the primary site,
(C) Re-irradiation in previously treated areas either for recurrence or second primaries in the same area or site. **(Sedky et al. 2001 and Spiro et al. 2002)**

With the aid of new technologies such as three dimensional imaging (3D) and image guided application; brachytherapy became now more easier, safer and much more accurate. All of these approaches require delineation of the target volume and critical structure surfaces from 3D imaging studies, allowing the integration of 3D imaging data and 3D dose distributions and hence improving the conformality of treatment. (**Martel et al. 2006)**

Brachytherapy in it's various forms remains an excellent tool for achieving control and cure for locally confined head and neck cancers. The high degree of conformality cannot be equaled even by modern day external beam radiotherapy (EBRT) techniques like intensity modulated radiation therapy (IMRT) and image guided radiation therapy (IGRT). Proper patient selection, experience and skill are of utmost importance in ensuring the best outcome.**(Shrivastava et al. 2006)**

Aim of work

The aim of the work is to overview the applications of brachytherapy as an established technique in treating head & neck cancers and the recent advances in technology that improved radiation planning and delivery of such a technique; throwing light upon modern brachytherapy which is highly selective and adaptive as a competitive tool in the multidisciplinary treatment of head & neck malignancies.

Review Of Literature