



Radiotherapy for NSCLC: Review of conventional and new treatment techniques

Ahmed Saadeddin

Riyadh Military Hospital, Riyadh, Saudi Arabia

KEYWORDS

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Summary Radiotherapy is an essential modality in the management of lung cancer. It is used as a single modality or in combination with other modalities and aimed at cure or palliation. Recent advances in the simulation techniques or more precise targeting of the tumor made radiotherapy more effective tool in the fight against lung cancer. Using PET scan and better gating for tumor motion are examples of these advances.

This brief review will present summary of the role of radiotherapy in management of lung cancer.

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Introduction

Radiotherapy is used for the treatment of NSCLC in many ways. It is the primary treatment modality for locally advanced unresectable tumors, and it is usually given concomitantly with chemotherapy [1].

In the postoperative setting, it used as an adjuvant treatment for stage 3 NSCLC aiming to improve local control. Radiotherapy is also frequently used for the palliation of advanced and metastatic lung cancer.

Radiotherapy for NSCLC is usually delivered using external-beam radiotherapy via a linear accelerator. Newer techniques, such as three-dimensional conformal techniques (3D-CRT) had improved the toxicity profile and allowed to escalate the dose by

better protection of normal tissues from unnecessary radiation [2].

Recently 4D-CRT planning techniques accounting for lung motion during radiotherapy treatment had improved precision of dose delivery to intended tumor target.

Definitions

Conventional radiotherapy

Where very large fields of radiation are used to treat the tumor with a margin and regional lymph nodes (LNs) electively.

Conformal radiotherapy

Where limited fields of radiation are used to treat only the primary tumor and involved lymph nodes only.

E-mail address: dr.saadeddin@yahoo.com

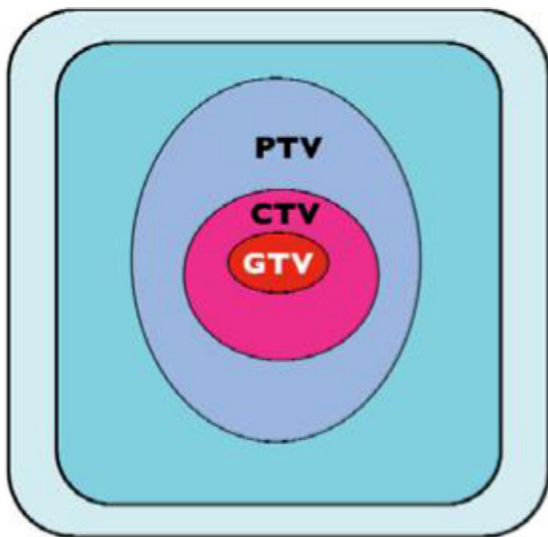


Figure 1 Illustration of various radiation fields for gross tumor volume (GTV), clinical tumor volume (CTV), and planning target volume (PTV).

Brachytherapy is the delivery of radiation inside the airways; it is used mostly for palliative purposes.

The International commission on Radiation units and measurements definitions of target volumes (ICRU 1993, 1999).

Gross tumor volume (GTV)

Macroscopic extent of the malignant growth, e.g. clinically palpable and/or visualized by imaging.

Clinical target volume (CTV)

Anatomical clinical concept that needs to be defined before delineation. It contains GTV and/or subclinical disease which should be eliminated.

Planning target volume (PTV)

Geometrical concept

A 3-D expansion of the CTV to account for all the geometrical uncertainties (for target and organ at risk of motion, set up errors delineation and anatomical changes during treatment) (see Fig. 1).

Conventional radiotherapy

Conventional radiotherapy is two-dimensional (2-D) techniques where AP/PA parallel opposed fields are used to treat the primary tumor and mediastinal LN with a relatively wide margin to account for set up and motion errors due to breathing lung movement.

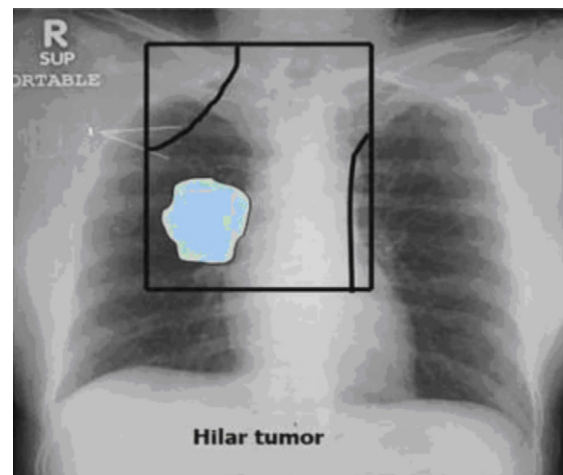


Figure 2 Field borders for hilar tumors.

The field borders are usually defined based on the original location of disease and potentially involved lymph nodes.

Although such techniques are mostly used for palliative setting, it is not advised to use it for curative approach due to poor results in local control, survival and normal tissue toxicity.

Figs. 2 and 3 are examples of field arrangements to treat tumors at different locations.

Conventional definition of radiotherapy curative doses

AP/PA parallel opposed fields can be used until a dose of 46 Gy. Then effort to spare the spinal cord should be made while taking the primary tumor and involved LN to full dose of 60 Gy.

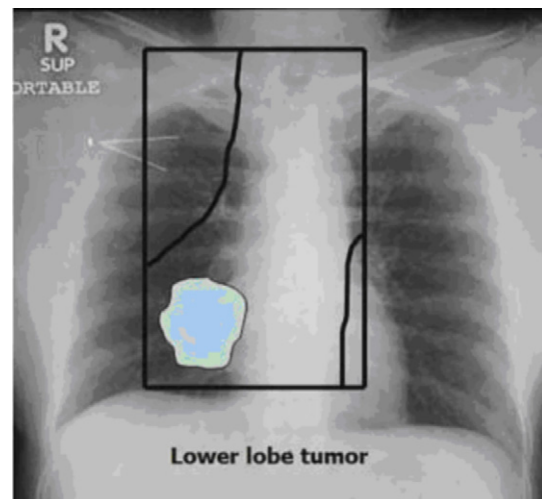


Figure 3 Field borders for lower lobe tumors.

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