STUDY OF THE PROCESSING CONDITIONS OF CR LINACGRAPHY IN A NECK, A BREAST, AND A LUNG FIELD
—ABOUT AN ERROR PICTURE AND ITS CORRECTIVE STRATEGY—

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(Received 28 November 2005, accepted 20 March 2006)

Abstract: It is important to obtain clear linacgraphy images (LG images) in order to confirm the positions of
the exposure field and surrounding structures. At our institution, LG images are acquired using computed
radiography (CR). Although clear images of the abdominal and pelvic regions can be obtained, error images
are commonly observed in LG images of the neck, breast, and lung fields. Here, the term "error image" refers
to an image that shows appropriate density only in the exposure field and cannot provide sufficient information
in surrounding areas. In the present study, in order to identify the causes of this problem, we developed a new
method for quantitatively evaluating image sharpness using a tough water step phantom and conducted
investigations to determine the imaging conditions providing optimal image quality.

Using this method, we performed radiography for the tough water step phantom, which has X-ray absorption
characteristics similar to those of the human body, under the same conditions used to acquire LG images,
determined the line spread function (LSF) by analyzing the edge spread function (ESF) of the obtained edge
image, and quantitatively evaluated image sharpness at full width at half maximum (FWHM).

Three key factors were found to affect the quality of LG images acquired using CR: the internal structure of
the cassette, the type of metal intensifying screen, and the image processing method. It was also found that
error images were generated due to inappropriate image processing. For the abdominal and pelvic regions, it
was possible to obtain clear LG images with relatively narrow latitude (Ave.1.0 at an X-ray energy of 4 MV
for the FCR system manufactured by Fujifilm Medical Co., Ltd.). On the other hand, for the neck, breast, and
lung fields, it was necessary to set a large latitude (Ave.2.0) to obtain optimal image quality because the
subjective contrast is significant in these regions. Thus, we were able to overcome the problem for LG images.

It was also found that the flexible noise control (FNC) function, which has been developed for noise reduction,
was related to the latitude setting. Although the FNC function operates properly for images with narrow
latitude such as those of the abdominal and pelvic regions, image sharpness is increased when the FNC
function is not used for images with large latitude such as those of the neck, breast, and lung fields.

Key words: Linacgraphy, Portal image, Computed radiography, Image processing, FNC
STEREOTACTIC RADIOTHERAPY FOR LUNG CANCER USING
ACTIVE BREATHING CONTROL SYSTEM

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(Received 27 December 2005, accepted 20 March 2006)

Abstract: In Tohoku University Hospital, primary or metastatic lung cancers with the respiratory motion of
more than 1 cm were treated with SRT (stereotactic radiotherapy) under ABC (active breathing control: ABC-
SRT). The local control rate and lung toxicity treated with ABC-SRT were analyzed. The indication of ABC-
SRT is as follows: tumor size in largest diameter < 5 cm, motion distance < 1 cm, and patient’s consent to
treatment.

Nineteen patients (average age: 58.2 years, male 12: female 7) with 25 lesions were enrolled to ABC-SRT
during March 2000 and July 2004. Patients with primary lung cancer were four, the others with metastatic
cancer. Prescribed doses were 45 Gy/3 fr or 60 Gy/8 fr at the isocenter. ABC-SRT was successfully done for
all patients except one patient who failed to be given the prescribed dose (only 45 Gy/6 fr were administered).

In 24 lesions with complete treatment, the control rate in 1/2/4 years was 94.1%/74.0%/74.0%, respectively.
In tumors <2.5 cm size in largest diameter, the control rate was 90.0%, ≥ 2.5 cm, 42.9%, tendency of significance
(p=0.0579) was observed. One patient developed grade 2 pneumonitis (RTOG: Radiation Therapy Oncologic
Group/EORTC: European Organization for Research and Treatment of Cancer), who was then orally medicated
with steroid to cure. The others developed grade 0-1 pneumonitis. Although 10 of 19 patients were treated
with chemotherapy, the lung toxicity was relatively light. Reduction of PTV by ABC seem to reduce the lung
toxicity. In tumors <2.5 cm size in largest diameter, good control rate was acquired compared to the tumors
≥ 2.5 cm in size. We’re going to analyze the lung toxicity treated without ABC-SRT to compare the present
results.

Key words: Lung cancer, Stereotactic radiotherapy, Active breathing control, Lung toxicity
Evaluation of Short-Term Changes in the Health-Related Quality of Life of Patients with Localized Prostate Cancer Receiving High-Dose-Rate Brachytherapy With or Without External Beam Radiotherapy: Comparison with Patients Receiving Radical Retropubic Prostatectomy

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(Received 5 January 2006, accepted 21 April 2006)

Abstract: Purpose: To evaluate short-term changes in the health-related quality of life (HRQoL) of patients with localized prostate cancer receiving high-dose-rate brachytherapy (HDR-BT) with or without external beam radiotherapy (EBRT) and compare them with those in patients receiving radical retropubic prostatectomy (RRP). Materials and Methods: We have examined the HRQoL of a total of 92 men with localized prostate cancer receiving radical treatment at Kawasaki Medical School since May 1, 2004. Forty patients received HDR-BT+EBRT, 33 patients received HDR-BT alone, and 19 patients received RRP. We asked them to complete the 36-item Short-Form Health Survey (SF-36) and the University of California Los Angeles Prostate Cancer Index (UCLA-PCI) before and at one, and six months after treatment. Forty patients in the HDR-BT+EBRT group, 32 patients in the HDR-BT group, and 15 patients in the RRP group completed these HRQoL questionnaires. We examined short-term changes in the HRQoL scores in each group using Wilcoxon’s signed rank test and compared the RT (HDR-BT+EBRT or HDR-BT) group with the RRP group using Mann-Whitney’s U test. Results: In each group, the scores of most aspects of these HRQoL questionnaires declined at one month after treatment and rose again at six months after treatment. This change was most notable in the HDR-BT+EBRT Group. In the post-treatment scores of both RT groups, urinary function (UF) and sexual function (SF) scores for the UCLA-PCI were better than those of the RRP group. Conclusion: The declination of these HRQoL scores seems to bear some relation to the acute effects of each treatment modality, especially in the HDR-BT+EBRT group. Urinary function and SF were more favorable for the RT groups, but the evaluation of SF was most difficult in this study. Since we believe it is necessary to carry out a long-term and minute examination to evaluate the HRQoL of patients with localized prostate cancer more accurately, this study will continue.

Key words: Localized prostate cancer, Health-related quality of life, High-dose-rate brachytherapy, Radical retropubic prostatectomy
REVISION OF GUIDELINE FOR STRUCTURE OF RADIATION ONCOLOGY BY THE PATTERNS OF CARE STUDY

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(Received 20 February 2006, accepted 11 April 2006)

Abstract: “Guidelines for Structure of Radiation Oncology in Japan” was revised by referring to annual change of structure and process in Japan and to other international guidelines. These results were published as so called “Japanese Blue Book Guidelines”. Number of cancer patients who require radiation is increasing by more than 7% annually. The standard guidelines for annual patient load per FTE radiation oncologist were set at 200 (warning level 300), those per FTE radiation technologist 120 (warning level 200), and those per one external beam equipment 250-350 (warning level 400). As the standards of process, establishment of verifiable information system like radiotherapy database and hospital cancer registration was proposed. Economic analysis showed that enough profit to meet with these guidelines became available recently in most radiotherapy institutions except for the smallest group.

Key words: Patterns of Care Study, Radiation Oncology, Structural Guideline, Japanese Blue Book Guideline