

前立腺癌外部放射線治療におけるinter-fraction errorの検討  
—CT-リニアックシステムによるCTガイド下set-upのデータより—

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EVALUATION OF INTER-FRACTION ERROR DURING  
PROSTATE RADIOTHERAPY

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(Received 17 July 2007, accepted 19 November 2007)

**Abstract:** Purpose: To evaluate inter-fraction error (inter-fraction set-up error+inter-fraction internal organ motion) between treatment planning and delivery during radiotherapy for localized prostate cancer.

Methods and Materials: Twenty three prostate cancer patients underwent image-guided radical irradiation with the CT-linac system. All patients were treated in the supine position. After set-up with external skin markers, using CT-linac system, pretherapy CT images were obtained and isocenter displacement was measured. Results: The mean displacement of the isocenter was 1.8 mm, 3.3 mm, and 1.7 mm in the left-right, ventral-dorsal, and cranial-caudal directions, respectively. The maximum displacement of the isocenter was 7 mm, 12 mm, and 9 mm in the left-right, ventral-dorsal, and cranial-caudal directions, respectively. The mean interquartile range of displacement of the isocenter was 1.8 mm, 3.7 mm, and 2.0 mm in the left-right, ventral-dorsal, and cranial-caudal directions, respectively.

Conclusion: In radiotherapy for localized prostate cancer, inter-fraction error was largest in the ventral-dorsal directions. Errors in the ventral-dorsal directions influence both local control and late adverse effects. Our study suggested the set-up with external skin markers was not enough for radical radiotherapy for localized prostate cancer, thereby those such as a CT-linac system for correction of inter-fraction error being required.

Key words: Prostate cancer, CT-linac system, Inter-fraction error

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転移性脳腫瘍に対するマイクロマルチリーフコリメータを用いた  
直線加速器による定位放射線治療後の臨床経過と  
画像評価についての検討

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**THERAPEUTIC EFFECT OF LINAC-BASED STEREOTACTIC RADIOTHERAPY WITH  
MICRO-MULTILEAF COLLIMATOR FOR THE TREATMENT OF  
PATIENTS WITH BRAIN METASTASES**

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(Received 10 August 2007, accepted 19 November 2007)

**Abstract:** Purpose: To assess the efficacy of linac-based stereotactic radiotherapy (SRT) with micro-multileaf collimator in patients with brain metastases.

Patients and Methods: Data of 96 metastatic brain lesions of brain metastases in 60 patients treated by SRT between September 2003 and December 2005 were analyzed. The primary sites were lung (42 patients), breast (4 patients), colon (4 patients), and others (10 patients). In the treatment planning, PTV was defined as enhanced lesion (=GTV) plus 3 mm margin. To the isocenters of PTV, total dose of 39-42 Gy with 3 fractions were delivered.

Results: The median survival after SRT was 15.1 months. The 1-year and 2-year survival rates were 56%, 36%, respectively. The local control rate was 86.2% with no serious adverse effects. After the treatment of SRT, new brain metastases and/or meningeal carcinomatosis were detected in approximately half of patients.

Conclusion: SRT with a micro-multileaf collimator is an effective and safe modality in the treating patients with brain metastases.

Key words: Stereotactic radiotherapy, Micro-multileaf collimator, Brain metastases

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放射線治療からみたがん診療連携拠点病院  
－ JASTROデータベースによる分析－

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STRUCTURE ANALYSIS OF DESIGNATED HOSPITALS FOR CANCER CONTROL IN  
JAPAN FROM JASTRO CENSUS SURVEY DATABASE 2005

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(Received 21 May 2007, accepted 28 November 2007)

**Abstract:** The structures of 288 hospitals designated for cancer control and approved by Ministry of Health, Labour and Welfare in February 2006 were analyzed from radiotherapy aspects according to the JASTRO 2005 census survey data. The data were compiled from 266 hospitals. Overall 78,086 new patients were treated at these designated hospitals, which accounts for just a half the total number of patients in Japan. The structure of radiotherapy (RT) must be essential for cancer management, and our study showed the designated hospitals are insufficient in the RT requirement. No RT equipment is installed in 14 hospitals. Of 266, 109 hospitals treated less than 200 new patients, and 25 hospitals less than 100 in 2005.

The data analysis revealed that academic hospitals, JACC\* hospitals and others are reasonable in terms of structures and capacity of radiotherapy. Moreover, both academic and JACC hospitals play similar roles to designated prefectural hospitals in cancer management by radiotherapy.

\*: JACC: Japanese Association of Clinical Cancer Centers

Key words: Designated hospitals for cancer control, JASTRO database

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## ホウ素中性子捕捉療法後の末梢血リンパ球における マイクロヌクレウスの出現頻度の評価

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### BIOLOGICAL DOSIMETRY USING MICRONUCLEUS ASSAY OF LYMPHOCYTES FOR BNCT PATIENTS

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(Received 6 August 2007, accepted 4 December 2007)

**Abstract:** To estimate the biological total body radiation dose for BNCT (boron neutron capture therapy) patients, we investigated the frequency of micronuclei in the peripheral blood lymphocytes after neutron irradiation. After BNCT irradiation, blood samples were obtained from patients. Using cytochalasin B, the frequency of micronuclei present in cytokinesis-blocked cells was investigated. The evidence of acute radiation effect was studied based on a questionnaire answered by the chief physician. In an in-vitro neutron radiation study, we observed standard dose-response model induction and calculated the maximal biological dose estimation as 0.24 Gy-eq for head and neck tumor patients and 0.20 Gy-eq for brain tumor patients. The total body radiation dose obtained by biological estimation using the micronucleus assay correlated with the total effective dose of BNCT that was obtained by thermal neutron fluence and TLD estimation. The increased micronucleus frequency in BNCT patients was less than one-third of that in malignant tumor patients after X-ray radiotherapy. These findings demonstrate the usefulness of BNCT for selective high-LET radiotherapy. Additionally, post-BNCT suggests a low irradiation effect of cytological radiation damage allowing a high tumor target dose for each cancer patient.

Key words: Micronucleus, Lymphocyte, Boron neutron capture therapy, Acute radiation effect

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## 放射線治療における医学物理士・放射線治療品質管理士に関する アンケート調査結果報告

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### A QUESTIONNAIRE SURVEY OF MEDICAL PHYSICIST AND QUALITY MANAGER FOR RADIATION THERAPY

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(Received 14 September 2007, accepted 26 February 2008)

**Abstract:** A questionnaire survey of medical physicists and quality managers for radiation therapy was performed by the Japanese Society for Therapeutic Radiology and Oncology (JASTRO) Future Planning Committee. We mailed the questionnaire to 726 radiotherapy facilities with the answers returned from 353 radiotherapy facilities. The result showed 178 facilities were staffed by radiotherapy workers who were licensed medical physicists or quality managers. A staff of 289 was licensed radiotherapy workers. Most of the staff were radiotherapy technologists. Quality control for radiation therapy was rated satisfactory according to each facility's assessment. Radiation therapy of high quality requires continued education of medical physicists and quality managers, in addition to keeping up with times for quality control.

Key words: Medical physicist, Quality manager (of radiotherapy), Questionnaire survey, Quality control for radiation therapy

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## 放射線治療部門専用電子カルテシステムの開発

玉村 裕保<sup>\*1</sup>, 萩 勝彦<sup>\*2</sup>, 小川 芳司<sup>\*2</sup>, 柴田 雅道<sup>\*2</sup>DEVELOPMENT OF AN EXCLUSIVE ELECTRONIC RECORD SYSTEM FOR  
RADIOTHERAPY TREATMENT SECTIONHiroyasu TAMAMURA<sup>\*1</sup>, Katsuhiko HAGI<sup>\*2</sup>, Yoshiji OGAWA<sup>\*2</sup>, Masamichi SHIBATA<sup>\*2</sup>*(Received 5 July 2007, accepted 19 November 2007)*

**Abstract:** Recently, the hospital information system (HIS) has employed an electronic record system to ensure smooth operation without x-ray film and paper in many hospitals. A challenge is to safely manage significant amount of information acquired by recent sophisticated radiotherapy. Thus, the electronic record system is desirable to utilize a radiological information system (RIS) in radiotherapy section.

We developed the "exclusive electronic record system for radiotherapy" utilizing properties and functions of radiotherapy, in collaboration with AJS Co., Ltd. This system photographs images using RIS, and enables timely display of patient's computed tomography (CT), magnetic resonance imaging (MRI), etc. Patient's irradiation parameter, an irradiation advance situation, electronic portal imaging (EPI), etc., can also be displayed timely. In addition, information is automatically entered, and that information serves as a procedure by which is recognized and registered by attending doctors after the last identification, and treatment starts after that.

On the other hand, records of attending doctors, radiological technicians, and nurses are displayed together on entering screen of electronic record. Therefore, it is possible not only to share patient information between the medical staff, but also utilize as a database for this electronic record system by retrieval functions.

Comparison of information was easily attained on this electronic record, using the same disease (TNM), the same treated area, and also the same EBM, such as the patient's record and prognosis. Improvement in medical quality is expected by determining treatment policy for the radiotherapy patient using this electronic record system.

Key words: Electronic record, Radiotherapy, Radiological information system (RIS)

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