

局所再発high-risk群の子宮体癌に対する術後放射線治療成績

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POSTOPERATIVE RADIOTHERAPY FOR PATIENTS WITH HIGH-RISK
ENDOMETRIAL CARCINOMA: A CLINICAL EVALUATION OF
ONE INSTITUTION'S RESULTS

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Abstract: Purpose: A postoperative adjuvant therapy for high-risk endometrial carcinoma remains controversial due to its indication and method. To evaluate postoperative radiotherapy for endometrial carcinoma with high-risk factors of local recurrence, we retrospectively analyzed the patients treated in our institution.

Materials and Methods: We analyzed the 43 patients receiving curative surgery and postoperative radiotherapy for high-risk endometrial carcinoma in our institution from January 1994 to December 2003. The diseases were classified as surgical stage IB-IIIc (The General Rules for Clinical and Pathological Management of Uterine Corpus Cancer, The 2nd Edition). The numbers of cases are as follows: 2 cases in IB, 21 in IC, 7 in IIA, 3 in IIB, 3 in IIIa, 7 in IIIc, 39 in endometrioid adenocarcinoma (Grade 1: 19, Grade 2: 12, Grade 3: 8), 3 in adenosquamous carcinoma, 1 in adenoacanthoma, respectively. Patients were treated with 4 or 10 MV X-ray using 1.8–2.0 Gy once daily fractionation, and a total dose ranged from 45 to 50.4 Gy (median, 50 Gy). The whole pelvis was irradiated, and in one patient the para-aortic nodal region was also irradiated. The follow-up time ranged from 12.6–124.9 months (median, 39.6 months).

Results: The 3-year local control rate and overall survival rate were 93.8% and 91.8%, respectively. There were six patients with local or distant failure. Local recurrence was observed in cases of stage IC, distant failure was observed in cases of stage IC-III. The grade ≥ 3 ileus (including Grade 4) was observed in four patients as adverse events.

Conclusion: The treatment result of postoperative radiotherapy for high-risk endometrial carcinoma of stage IB-IIIc received curative surgery in our institution was considered acceptable in light of many clinical reports. The problems to be solved involve developing radiotherapy to decrease adverse events plus establishing construction strategies and stratification including chemotherapy and vaginal brachytherapy.

Key words: Endometrial carcinoma, Postoperative radiotherapy, Local recurrence.

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体幹部定位放射線治療におけるEPIDポータル画像を用いた ターゲット位置のずれ量推定方法の開発

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AUTOMATED METHOD FOR ESTIMATION OF DISPLACEMENT OF TARGET POSITION ON EPID CINE IMAGES WITHOUT IMPLANTED MARKERS IN STEREOTACTIC BODY RADIOTHERAPY

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Abstract: The purpose of this study was to develop a computerized method for measuring displacement vectors at a target position on electronic portal imaging device (EPID) cine images in treatment without implanted markers in stereotactic body radiotherapy. Our method was based on a template matching technique with cross-correlation coefficient between the reference portal (RP) image and each consecutive portal (CP) image acquired by EPID. EPID images with 512×384 pixels (pixel size: 0.56 mm) were acquired in a cine mode at a sampling rate of 0.5 frame/sec by using an energy of 4, 6, or 10 MV on two linear accelerators. The displacement vector of the target on each cine image was determined from the position at maximum cross-correlation coefficient between the RP image and CP image. We applied our method to EPID cine images of a lung phantom with a tumor model simulating respiratory motion, and 5 cases with a non-small cell lung cancer and one case of metastasis. For validation of our proposed method, displacements of a target position calculated by our method were compared with those obtained manually by two radiation oncologists. As a result, for lung phantom images, target displacements by our method relatively correlated well with those by the oncologists ($r=0.972-0.994$). Correlation values for 4 cases ranged from 0.854 to 0.948, while the values for the other 2 cases were 0.609 and 0.644. This preliminary result suggested that our method may be useful for monitoring displacements of target positions without implanted markers in stereotactic body radiotherapy.

Key words: Stereotactic body radiotherapy, EPID, Target displacement, Computerized method

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全身照射用ウェッジフィルタの作成

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PILOT PRODUCTION OF THE WEDGE FILTER FOR
THE TBI (TOTAL BODY IRRADIATION)

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Abstract: Total body irradiation (TBI) is performed by various methods, such as a long SSD method and a translational couch method. For patient safety in carrying out TBI, the patient should be placed on the supine position and prone position near the floor. TBI is performed from 2 opposite ports (AP/PA) with a linear accelerator (10 MV X-ray). We experimented with a wedge filter for TBI created by us, which makes dose distribution to a floor uniform. The wedge filter, made of iron alloy, was attached to the linear accelerator. In designing the wedge filter, thickness of the lead-made wedge filter can be calculated numerically from the ratio of linear attenuation coefficient of iron alloy and lead. In measuring the dose profile for a phantom of 20 cm thick, dose homogeneity less than 10% was proved by the wedge filter for TBI.

Key words: TBI (total body irradiation), Long SSD method, Wedge filter

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食道癌に対する加速過分割照射の治療成績

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TREATMENT RESULTS OF ACCELERATED HYPERFRACTIONATED
RADIOTHERAPY FOR ESOPHAGEAL CANCER

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Abstract: Purpose: To evaluate the treatment results of accelerated hyperfractionated radiotherapy (AHF) for esophageal cancer.

Materials and Methods: Between 1997 and 2002, 17 patients with Stages I–III esophageal squamous cell carcinoma were treated by AHF. Patients included 15 men and 2 women. Median age was 72 years. AHF was performed by field in field technique (1.8 Gy for large field and 1.2 Gy for small field). Median total radiation dose was 66 Gy and median overall treatment time was 35 days.

Results: The overall and cause specific survival rates at 5-years were 35% and 51%, respectively. The complete response (CR) rate was 82% (14/17 patients). Among 14 CR cases, 7 experienced recurrences; 2 patients in the esophageal primary site, 4 in the regional lymph node and 1 in the regional lymph node with distant metastasis. Metachronous multiple esophageal cancers developed in 2 patients (12%). As an acute complication, grade 3 esophagitis occurred in 2 patients (12%).

Conclusion: Our study suggests that AHF should be considered as a treatment option for esophageal cancer patients without the indication of standard chemoradiotherapy.

Key words: Esophageal cancer, Accelerated hyperfractionation radiotherapy

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4D-CTの物理学的評価

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PHYSICAL EVALUATION OF FOUR DIMENSIONAL COMPUTED TOMOGRAPHY

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Abstract: Purpose: The purpose of this study was to perform physical evaluation of 4D-CT. Materials and Methods: 4D-CT can be accomplished by CT data being correlated, sequentially acquired at each serial couch position, with externally monitored respiratory motion data. The RPM system (Varian Medical Systems, Inc., Palo Alto, CA, USA) recored respiratory motion . A 3D movable phantom system was used to simulate respiratory motion. Phantom studies were performed to measure imaged volume, shape, position and the mean CT number for a moving object. The sphere was automatically segmented using different thresholds on CT images. Results: The volume and the mean CT value correlated highly with the threshold and object motion, while the geometrical center and the sphericity did not show a significant dependency on these parameters. Compared to the standard axial data acquisition, 4D-CT images included only small gross residual motion artifacts. Conclusion: Our study showed that 4D-CT helps reduce artifacts resulting from motion. As a result, more accurate delineation of target, critical structure, and quantifying the extent of the tumor can be achieved. 4D-CT appears to be clinically of great significance in radiotherapy.

Key words: Four-dimensional computed-tomography, Physical evaluation respiratory motion

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OBJECTIVE ASSESSMENT OF BREAST SKIN REACTIONS AFTER BREAST-CONSERVING THERAPY

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Abstract: Objective: To determine an objective method for assessing skin reactions after radiotherapy following breast-conserving surgery.

Methods: 116 patients who had breast-conserving therapy were studied. The Mexameter[®] MX 18 (melanin & erythema index meter: Integral, distributor for Courage+Khazaka Electronic GmbH) was used to measure the erythema and melanin indices of the breast skin. The results were compared to those obtained from the non-irradiated contra lateral breast skin, and their evolution over time was examined. For both the erythema and the melanin indices, the ratio of the irradiated-side index to the non-irradiated-side index was calculated.

Results: The erythema index ratio of the skin was high in patients who had just undergone radiotherapy but low in patients who had undergone radiotherapy more than one year earlier. There was a significant decrease in the erythema index ratio up to one year after radiotherapy. The patients who showed high melanin index ratio (≥ 1) increased significantly at one year after radiotherapy. In areas that had received electron beam irradiation, there were only small decreases in the erythema index ratio with time following radiotherapy.

Conclusion: Our study suggests the present method was useful in providing an objective method of assessing skin reactions following breast-conserving therapy.

Key words: Breast-conserving therapy, Erythema index, Melanin index

前立腺がんI-125小線源永久挿入療法における術中修正法

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INTRAOPERATIVE MODIFICATION METHOD IN THE TRANSPERINEAL
PERMANENT IMPLANT OF I-125 SEED IN PROSTATE CANCER

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Abstract: In the Department of Radiation Therapy and Oncology, International Medical Center of JAPAN, transperineal permanent implant (TPI) of I-125 seeds have been performed since April 2004. In April the planning method was changed from the preplanning to the intraoperative modification method in April 2006. Various dose parameters were compared between the 106 patients treated by preplanning and the 42 patients undergoing the intraoperative modification. The mean operation time was 84 minutes in the preplanned method and 92 minutes in the intraoperative modification. The prostatic volume reduced at the postplanning, compared to the preplanning. Dosimetric parameters of prostate (V100, V150, and D90%) diminished at the time of postplanning with a statistical significance, while the degree of the reductions was greater in the patients treated by the preplanned method. The mean prostate V100 of the preplanning and the intraoperative modification was 89% and 93.3%, respectively, and the mean prostate D90% was 100% and 111%, respectively, both with a statistically significant difference. In contrast, urethral and rectal dose parameters were the same in both methods. The intraoperative modification method was useful to attain the high quality permanent implant of I-125 seeds.

Key words: Prostate cancer, Permanent implant, Brachytherapy, Preplanning, Intraoperative modification

85歳以上の超高齢者悪性腫瘍に対する放射線治療の検討

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RADIOTHERAPY FOR PATIENTS WITH MALIGNANT
DISEASES AGED 85 YEARS OR OLDER

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Abstract: Purpose: To assess the efficacy and problems of radiotherapy for patients aged 85 or older. Patients and Methods: Forty-five patients were assessed (oldest old group): They were 85 years of age or older and had received radiotherapy between September 2002 and September 2005. Sixty-nine patients, 75 years of age at the start of radiotherapy, were also assessed (old group). Results: In the oldest old group, there were 21 men and 24 women, and median age was 87 years (range; 85-99). The sites of disease were: 10 in head and neck, 5 in lung, 5 in malignant lymphoma, 4 in skin, 4 in esophagus, 2 in breast, 2 in uterine cervix, 2 in rectum, 2 in soft tissue, 2 in metastatic bone tumor, 7 in others. The treatment was deemed curative in 49%, palliative in 40%, and others in 11%. Treatment fields were limited due to performance status (PS) or age in 13 patients. The rate of treatment completion was 91% (41/45). Eleven of 26 inpatients were admitted because of difficulty in hospital visit. Seventeen of 19 outpatients needed familial escort. Of patients completed radiotherapy, 47% of the patients achieved CR, 37% achieved PR, and 16% achieved NC in the group of curative radiotherapy, and 88% of the patients achieved effective response, and only 2 cases resulted in ineffective response in the group of palliative radiotherapy. While only one patient received grade 3 dermatitis and mucositis, other patients received grade 2 and below adverse events. Three patients resulted in deterioration of PS, and 2 patients deteriorated dementia. Although higher rates in female patients, worse PS, and limitation of treatment field were seen in the oldest old group, there were no significant difference in terms of the rate of treatment completion, effectiveness, and adverse events between the two groups. Conclusion: Our study showed radiotherapy is effective and well tolerated in patients aged 85 or older. Considering the oldest old requiring radiotherapy continues to increase, a supporting system for patients and their families is needed.

Key words: Radiotherapy, Elderly, Oldest old

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過去26年間における放射線治療患者13,526例の予後

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PROGNOSIS OF 13,526 RADIATION THERAPY PATIENTS DURING LAST 26 YEARS

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Abstract: The prognosis of 13,526 radiation therapy patients in one institution over the past 26 years was analyzed. The study population consisted of 7,463 male patients and 6,063 female patients, breaking down to 2,593 head and neck cancer patients, 1,863 breast cancer patients, 1,829 esophageal cancer patients, and 1,277 brain tumor patients. In recent years, the numbers of patients with breast cancer and with prostate cancer have increased. The follow-up rate was 93.2%. The 5- and 10-year overall survival rates of all cases were 41.6% and 31.4%, respectively. The 5- and 10-year overall survival rates of the curative radiation therapy group and the postoperative radiation therapy group were 39.5% and 29.0%, and 59.6% and 46.6%, respectively. Late complications developed in 522 patients (3.9%), and in 10.2% patients followed up ten years or more.

Key words: Radiotherapy, Prognosis, Survival rate, Complication

下咽頭癌に対する化学療法同時併用重粒子線治療
preliminary report

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CONCOMITANT CHEMORADIOTHERAPY WITH CARBON ION BEAMS FOR
HYPOPHARYNGEAL CARCINOMA—PRELIMINARY REPORT—

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Abstract: Recent treatment of the photon radiotherapy for hypopharyngeal carcinoma have made significant improvement with more intensive methods such as accelerated hyperfractionation or combination with chemotherapy. As intensity of the therapy increased, adverse normal tissue reactions developed. To improve these conditions, we started carbon ion radiotherapy with concomitant weekly cisplatin. This is a preliminary report of concomitant chemoradiotherapy with carbon ion beams for hypopharyngeal carcinoma.

The design of the protocol was phase I/II dose escalation study. The starting dose-fractionation schedule was 57.6 GyE/16 fractions/4 W (3.6 GyE per fraction). The target volume included the primary tumor, infiltrated lymph nodes, and prophylactic bilateral cervical lymphatics. Cisplatin 30 mg/m² were concomitantly administered during the treatment on day 1, 8, 15, 22. All treatments were given for 4 weeks.

Between September 2004 and August 2006, 7 patients were registered. Five patients were diagnosed with Stage III, and 2 with Stage IV. Three patients received 57.6 GyE, and four patients 60.8 GyE. The median follow-up period was 10.4 months. No severe acute reactions were seen. At eight months from the start of the treatment, one patient developed grade 3 edema in his larynx (RTOG/EORTC). As for the local control, one patient developed local recurrence, and the salvaged surgery freed this patient from the disease.

The preliminary report of Phase I/II was provided; Phase I/II studied the dose escalation of carbon ion radiotherapy for hypopharyngeal carcinoma. Further research is needed.

Key words: Heavy charged particle therapy, Hypopharyngeal carcinoma, Carbon ion radiotherapy, Chemoradiation

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T2N0声門癌の放射線治療成績に影響を及ぼす因子の検討

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FACTORS INFLUENCING THE TREATMENT OUTCOME FOR PATIENTS WITH T2N0 GLOTTIC CARCINOMA TREATED BY DEFINITIVE RADIOTHERAPY

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Abstract: Purpose: The purpose of this study was to determine the prognostic factors affecting local outcomes for patients with T2N0 glottic carcinoma treated by definitive radiotherapy.

Materials and Methods: A total of 48 patients with T2N0 squamous cell carcinoma treated by definitive radiotherapy between 1992 and 2005 were studied. Cumulative probability of overall survival, cause-specific survival, local control and larynx-preserving were calculated according the Kaplan-Meier method, and the prognostic significance of patient's age, number of subsites involved, impaired cord mobility, anterior commissure involved, total dose and overall treatment time were analyzed using the log-rank test in univariate analysis and Cox regression in multivariate analysis. Follow-up ranged from 13 to 141 months (median, 62 months).

Results: Five-year survivals were: overall, 95.3%; cause-specific, 97.9% and five years rates were local control, 61.4%; larynx-preserving, 76.4%. Multivariate analyses of the six parameters showed that overall treatment time significantly influenced the probability of local control, and impaired mobility and overall treatment time affected the probability of larynx-preserving.

Conclusion: Our study showed that longer overall treatment time significantly worsened the percentage of local control and larynx-preserving for patients with T2N0 glottic carcinoma treated with definitive radiotherapy. Therefore, we suggest treating, the patients in a shorter treatment course.

Key words: Radiotherapy, Glottic carcinoma, Overall treatment time

患者位置決めにおける治療台学習機能システム構築の有用性の検討

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EVALUATION OF SETUP CORRECTION SYSTEM BASED ON
DAILY TABLE POSITIONS AFTER ALIGNMENT

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Abstract: Purpose: To reduce systematic setup errors in patients for radiotherapy, a sophisticated setup correction system based on daily table position after alignment has been developed. The purpose of this study was to estimate the reduction in systematic setup errors for patients using this system.

Materials and Methods: Sixteen prostate and 9 head-and-neck (H & N) cancer patients in the setup with or without this system were analyzed. The setup errors in translational and rotational directions were measured by displacing the coordinates of bony landmarks on the orthogonal digital radiographs from those on the simulation radiographs.

Results: For prostate and H & N patients, translational and rotational displacements were significantly reduced with the use of this system compared with the results the conventional method ($p < 0.05$). We observed significant differences in the variances in rotational directions between two groups ($p < 0.01$). In patients with this system, a notable decrease in systematic errors was observed, while no difference was found in the random errors between the two groups.

Conclusion: This system was effective for reducing setup errors in particle therapy for prostate and H & N cancer. These data suggest that this system provides a highly efficient method to reduce systematic setup errors.

Key words: Systematic setup error, Setup margin, Particle therapy

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