

頭頸部腫瘍に対する炭素イオン線治療の電子クリニカルパス作成

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CANCER TREATED WITH CARBON ION RADIOTHERAPYAsuka EBISUTANI^{*1}, Satsuki OKABE^{*1}, Masao MURAKAMI^{*2,*3},
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Abstract: Purpose: To develop an electronic clinical path for patients with head and neck (H & N) tumor treated with carbon ion radiotherapy (RT) focusing on acute reactions of the oral mucosa and the skin.**Materials and methods:** Between January and July, 2002, fifteen patients with H & N tumor had been treated with carbon ion radiotherapy including oral cavity in the RT fields. Acute reactions of the oral mucosa and the skin were analyzed together with face scales (FS) that is an indicator of quality of life obtained daily from patients during RT courses. Medical interventions including prescription for mucositis or dermatitis, nursing care, and changes of meal were also analyzed.**Results:** Average period of being in hospital was 42.6 ± 3.6 days and that of radiation was 27.0 ± 1.9 days. Radiation mucositis appeared 5 days (10.8 GyE) after start of carbon ion RT, reached a maximum reaction at 20 days (Grade 1: 7%, Grade 2: 33%, Grade 3: 60%), and recovered less than Grade 1 at 44 days on average. Radiation dermatitis also appeared 8 days (18 GyE), reached a maximum at 33 days (Grade 1: 47%, Grade 2: 40%, Grade 3: 13%), and recovered less than Grade 1 at 51 days on average. Changes of FS showed deterioration 23 days after start of therapy. At the latter half of RT courses, mucositis, FS, and dermatitis reached a maximum in that order. Through analyses of the time-score plots, the change of FS seemed corresponding to that of dermatitis. The required medical interventions were change of meal in 10, analgesics in 8, and gargles in 15 patients. Based on these results, we established a clinical path as a trial piece.**Conclusions:** We confirmed that there was a specific pattern in ups and downs of acute reactions of the oral mucosa and the skin during a RT course. We concluded that a clinical path is useful for patients with H & N cancer treated with carbon ion RT.**Key words:** Clinical path, Carbon ion radiotherapy, Acute toxicity**要旨:**【目的】炭素イオン線治療をうけた頭頸部腫瘍患者の口腔粘膜, 皮膚反応, フェーススケール (FS) に焦点を当てた検討から電子クリニカルパスを試作する。

【対象・方法】2002年1月~2002年7月に炭素イオン線治療を受けた頭頸部腫瘍患者のうち口腔が照射野に含まれた15例を対象とした。口腔粘膜と皮膚の急性反応, およびFS (5段階) の経時的な変化を分析した。食事変更, 口腔ケア, 皮膚ケアの内容や時期の検討を行った。

【結果】入院期間, 治療期間はそれぞれ平均42.6日 \pm 3.6日, 平均27.0日 \pm 1.9日であった。粘膜炎は治療開始5日目 (10.8 GyE) から出現し, 治療開始後平均20日目にピーク (Grade 1: 7%, Grade 2: 33%, Grade 3: 60%) となり, 平均44日目ごろよりGrade 1に改善した。皮膚炎は治療開始8日目 (18 GyE) から出現し, 平均33日目にピーク (Grade 1: 47%, Grade 2: 40%, Grade 3: 13%) となり, 平均51日目でGrade 1以下に改善した。FSのピークは治療開始23日後であった。以上より, 照射後半~終了後にかけて口腔粘膜炎・FS・皮膚炎の順にピークが見られ, FSの経時的変化は口腔粘膜炎に従った。処置を必要とした患者は, 食事変更は10例, 鎮痛剤使用8例, 含嗽薬15例であった。

【結論】入院期間, 治療期間に症例間の大きな差はなく, 口腔粘膜, 皮膚反応, FSは経時的に一定のパターンがあることから, 頭頸部がん患者に対する炭素イオン線治療はクリニカルパスによる看護ケアが可能であると考えられた。

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膵癌術中照射後の予防的全肝照射の安全性と臨床的意義

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PROPHYLACTIC HEPATIC IRRADIATION AFTER CURATIVE RESECTION WITH
INTRAOPERATIVE RADIOTHERAPY FOR CARCINOMA OF THE PANCREASKoichi INOUE^{*1}, Susumu KATANO^{*1}, Iwao TSUKIYAMA^{*1}, Shoichi HISHINUMA^{*2}, Yoshiro OGATA^{*2}

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Abstract: Carcinoma of the pancreas is one of the most uncontrollable malignancies. Even if curatively resected, its prognosis may be limited by distant metastases (liver metastases, peritoneal seeding, and so on). From 1994 to 2002, 29 patients were treated with prophylactic hepatic irradiation after curative resection with intraoperative radiotherapy. During the hepatic irradiation continuous intravenous infusion of 5-FU (5 mg/kg/day) was performed. Therapy-associated death occurred in 2 patients (6.9%), one had liver failure and the other from infection due to a liver abscess. Grade 3 liver abscess occurred in 2 patients (6.9%). However the prophylactic hepatic irradiation did not increase toxicities compared with the group without hepatic irradiation. The hepatic toxicities occurred in most patients who received 22 Gy/ 20 fr/12 days as the prophylactic hepatic irradiation. And so, we changed the protocol. Now the prophylactic hepatic irradiation is performed as 20 Gy/20 fr/12 days under continuous intravenous infusion of 5-FU (5 mg/kg/day) during the hepatic irradiation. We recently began to develop the prophylactic hepatic irradiation procedures with multibeam or oblique beam planning for optimized 3-dimensional dose distribution.

Key words: Resected pancreatic cancer, Prophylactic hepatic irradiation, Systemic chemotherapy, Intraoperative radiotherapy

要旨：膵癌術中照射後に5-FUを併用した予防的全肝照射を追加することの安全性と治療成績について検討した。肝転移および腹膜播種のないR0切除症例29例が対象であり、術後病期の内訳はstage III/IVa/IVbが5/15/9例であった。全肝照射は10 MVのX線を用いて総線量を19.8～22.0 Gyとし、照射開始日から終了日までの間に5-FU 5 mg/kg/dayの持続静注が併用された。治療関連死は肝不全が1例、肝膿瘍を伴う感染症が1例であった。その他の重篤な有害事象としてGrade 3の肝膿瘍を2例に認めた。しかし全肝照射が治療関連死や合併症を有意に増加させている印象はなかった。ただし1日2回照射での22 Gy/20 Fr/12 daysの全肝照射を施行した症例で肝関連の有害事象がみられたことから、全肝照射プロトコールを1日2回照射での20 Gy/20 Fr/12 daysに切り替えた。現在ではさらに線量分布の適正化を期待して多門照射を積極的に導入している。

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THE IMPLICATION OF GEOMETRICAL SPARING FACTOR OF REFERENCE POINTS FOR LATE COMPLICATIONS FOLLOWING UNIFORM EXTERNAL RADIOTHERAPY AND HIGH-DOSE-RATE BRACHYTHERAPY FOR CERVICAL CANCER

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Abstract: Purpose: This study aimed to correlate the predictive values of geometrical sparing factors of rectum and bladder in high-dose-rate intracavitary brachytherapy (HDRICB) after uniform external beam radiotherapy with late sequelae in patients with uterine cervical cancer.

Methods: From September 1992 to December 1998, 154 patients who survived more than 12 months after treatment were studied. Initially, they were treated with 10 MV X-rays (44 to 45 Gy/22 to 25 fractions over 4 to 5 weeks) to the whole pelvis, after which HDRICB was performed using Ir-192 remote after-loading at 1-week intervals for 4 weeks. The standard prescribed dose for each HDRICB was 6.0 Gy to point A. Geometrical sparing factor (GSF) is defined as the ratio between reference doses in HDRICB and point A dose, whereas biological GSF is modified by using a linear-quadratic model. Patient and treatment related factors were evaluated for late rectal complications using Student's t-test and chi-square test.

Result: The probability of rectal complications shows better correlation with increasing biological GSF. If the biological rectal GSF was less than 0.6, the probability of rectal complication did not exceed 20%, while the biological bladder GSF was less than 0.8, the probability of bladder complication did not exceed 10%. The analysis demonstrated a high risk of late rectal sequelae in patients who developed bladder complications ($p=0.0001$, relative risk, 15.6) and biological rectal GSF >0.6 ($p=0.02$, relative risk, 2.08). The high risk factors for bladder complications were patients who developed rectal complications ($p=0.0001$, relative risk, 15.2) and biological bladder GSF >0.8 ($p=0.04$, relative risk, 2.85).

Conclusion: This study demonstrated the predictive value of rectal and bladder GSF in HDRICB for patients receiving uniform EBRT. Patients who had higher biological GSFs were at risk of late sequelae. Further study is imperative to delineate the close relationship between rectal and bladder complications.

Key words: Cervical cancer, Brachytherapy, Late sequelae, Geometrical sparing factor

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異なる施設間での肺小腫瘍GTVの解析

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VARIATIONS IN VOLUME AND SPATIAL DISTRIBUTION OF CONTOUR
DELINEATION ON GTV AMONG DIFFERENT FACILITIES

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Abstract: Purpose: To verify operator-based contour delineation on GTV (Gross Tumor Volume) among different facilities using radiotherapy planning systems (RTPS), and to compare their results in terms of volume and spatial distribution.

Method: GTV outlines were delineated for two pulmonary carcinoma (T1N0M0) cases in six radiation therapy facilities using the Radiotherapy Treatment Planning System (RTPS) capability of each facility. Image sizes and resolutions were different among each facility. Therefore, helped by anatomical landmarks, the tumor and surrounding regions were excised using sequential CT images in order to standardize all of the images to equal size (500 × 500 pixels) and position. Image magnifications (pixels/mm) was calculated from the image scale shown on the RTPS. A summation of the GTV areas for each section were calculated and multiplied by the slice thickness to obtain the calculated value of GTV (GTVc). GTV images were analyzed to study differences in GTV among the various facilities. The mean and variance of the GTV images for all the facilities were obtained.

Result: The GTVc values were 7.0 ± 0.7 ml (case 1) and 12.3 ± 1.8 ml (case 2). The values obtained directly from RTPS (GTVr) were 7.0 ± 0.7 ml and 12.1 ± 1.7 ml, respectively. Differences were seen among the volumes and spatial distributions of GTV. Variation of the image in case 2 indicated that GTV differences were large where the bronchus and the vessels were close to the tumor.

Conclusion: Image areas that overlap vascular structures tend to indicate relatively large variations in GTV.

Key words: Lung cancer, Stereotactic radiotherapy, Delineation, Inter-clinician variability

要旨:【目的】肺癌肺小腫瘍に対する定位放射線治療 (SRT) 治療計画において,異なる治療計画装置を使用する放射線治療施設でのGTV輪郭設定,体積,空間分布の差異を統計画像により解析し検討する.

【方法】T1肺癌2例に対して6施設において異なった治療計画装置 (RTPS) を用いてGTVの輪郭設定を行なった.輪郭は各施設の各々のRTPSで描画し,スクリーンキャプチャにより画像として得られた.施設毎に画像サイズや解像度が異なるため,腫瘍近傍領域を解剖学的指標に基づき全画像で位置が等しくなるように切り出して同一サイズ (500 × 500 pixel) に調整した.同時にRTPS上で画像スケールを基に尺度 (pixel/mm) を算出,各断面でGTV輪郭内の面積を計算し,合計と画像間隔から体積 (GTVc) を算出した.施設毎のGTVの違いを画像的に評価するため,各施設の同一断面の画像から,それぞれの平均と分散の画像を製作した.

【結果】上記方法で得られた体積 (GTVc) 7.0 ± 0.7 ml (case 1), および12.3 ± 1.8 ml, RTPS上で測定した値 (GTVr) はそれぞれ7.0 ± 0.7 mlおよび12.1 ± 1.7 mlとほぼ一致した.施設間で輪郭設定とそれに基づいた標的体積に明らかな違いが見られる.分散画像上は気管支・血管等と近接した部分で施設毎の輪郭設定の違いが大きくなることが明らかになった.

【結論】血管像等と重なる場合などはGTV範囲の施設間差が大きくなり注意が必要である.

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上咽頭癌の頸部郭清術後に放射線治療を施行し、 舌下神経麻痺が発生した一例

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UNILATERAL HYPOGLOSSAL PALSY OCCURRING AFTER NECK DISSECTION AND RADIATION THERAPY FOR NASOPHARYNGEAL CANCER

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Abstract: A case of hypoglossal palsy after neck dissection and radiation therapy for the nasopharyngeal cancer is presented. A 50-year-old man with a diagnosis of the nasopharyngeal cancer in T1N1M0 underwent a modified radical neck dissection and curative radiation therapy with 67.5 Gy to the primary site. Five years and seven months after the therapy, hypoglossal palsy occurred. The literature on radiation-induced cranial nerve palsy was critically reviewed.

Key words: Hypoglossal palsy, Nasopharyngeal cancer, Radiation therapy, Cranial nerve palsy, Neck dissection

要旨：我々は上咽頭癌の頸部郭清術後に放射線治療を施行し、舌下神経麻痺が発生した症例を経験した。50歳男性。上咽頭癌（T1N1M0）の頸部郭清術後、原発巣に67.5 Gyの根治放射線治療を受け、5年7ヶ月後に舌下神経麻痺が起こった。放射線による脳神経麻痺の文献を引用して、考察を行った。

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脾臓への放射線照射が奏功した特発性血小板減少性紫斑病の1例

片山 敬久^{*1}, 山本 道法^{*2}, 井原 章裕^{*3}, 藤本 淳也^{*4}, 金澤 右^{*5}A CASE OF IDIOPATHIC THROMBOCYTOPENIC PURPURA TREATED BY
SPLENIC IRRADIATIONNorihisu KATAYAMA^{*1}, Michinori YAMAMOTO^{*2}, Akihiro IHARA^{*3},
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Abstract: A 74-year-old woman was in hospital because of a metastatic lung tumor from breast cancer. On April 3, 2001, the platelet count decreased to $4.1 \times 10^4/\mu\text{l}$, on April 18, to $1.6 \times 10^4/\mu\text{l}$. The number of megakaryocytes in bone marrow was rather small, but the concentration of platelet-associated IgG (PAIgG) increased and other diseases which were capable of inducing thrombocytopenia were excluded, and a diagnosis of idiopathic thrombocytopenic purpura was made. A 3-week course of corticosteroid therapy was ineffective. Splenic irradiation (1 Gy/fr, 3 fr/week, total 6 Gy) was performed instead of splenectomy because of her age, bad prognosis due to breast cancer stage IV and her general state was poor. Thereafter, although corticosteroid therapy was tapered, the platelet count increased to $7.8 \times 10^4/\mu\text{l}$ one month after the end of irradiation.

Key words: Idiopathic thrombocytopenic purpura, Splenic irradiation, Radiation therapy, Splenectomy

要旨：症例は74歳，女性．乳癌多発肺転移にて入院中，2001年4月3日，血小板数 $4.1 \times 10^4/\mu\text{l}$ ，4月18日，血小板数 $1.6 \times 10^4/\mu\text{l}$ と低下した．骨髓中に巨核球はやや少なかったものの存在し，platelet-associated IgG (PAIgG) は高値を呈し，血小板減少をきたしうる各種疾患が否定されたため，特発性血小板減少性紫斑病 (ITP) と診断された．3週間の副腎皮質ステロイド療法後も血小板数の回復が得られなかった．高齢であり全身状態も不良で，また乳癌IV期で余命が短いと予想されたため，摘脾は施行せず，脾臓への放射線照射を1 Gy/回，3回/週，合計6 Gyを施行した．その後，副腎皮質ステロイドを漸減したにも関わらず，照射終了後1ヶ月で血小板数 $7.8 \times 10^4/\mu\text{l}$ まで上昇した．

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早期下咽頭癌の放射線治療に関するアンケート調査結果報告

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**RADIOTHERAPEUTIC MANAGEMENT OF EARLY HYPOPHARYNGEAL CANCER:
A QUESTIONNAIRE SURVEY**

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Abstract: Early squamous cell carcinoma of the hypopharynx is a rare clinical entity, and the appropriate treatment strategy is not well known. Therefore, a national survey on the current status of treatment of early hypopharyngeal cancer was performed in 2003. We sent questionnaires to 118 main radiotherapy facilities in Japan and 59 (50%) responses were analyzed. Radical radiotherapy with or without chemotherapy was chosen as an initial treatment for stage I disease in 80% of institutions, and for stage II disease in 50% of institutions. Radiotherapy techniques varied widely depending on institutions. The role of radiotherapy in the management of early hypopharyngeal cancer should be established.

Key words: Early hypopharyngeal cancer, Radiotherapy, Surgery, Questionnaire

要旨: 早期下咽頭癌は比較的まれであり, 最適な治療法ははっきりしていない. 今回我々は早期下咽頭癌に対する治療法に関して, アンケート調査を行った. 全国の放射線治療施設118施設にアンケートを送付し, 59施設(50%)より解析可能な回答を得た. I期で約80%, II期で約50%の施設にて初回治療として, 根治的(化学)放射線治療が選択されていた. 照射法, 照射範囲について施設間のばらつきが大きかった. 今後早期下咽頭癌に対する放射線治療の役割を明かにすべきと考えられた.

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