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Comparison of AAA and PBC Algorithms in Radiotherapy Planning for Lung Carcinoma

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Purpose: To compare the does of target and does in lung carcinoma treatment planning by using AAA (Analytical Anisotropic Algorithm) and PBC (Pencil Beam Convolution) algorithm respectively.
Method and Materials: 10 radiotherapy treatment plannings of lung carcinoma were analyzed with single fraction does of 2 Gy and to total prescription dose of 66 Gy. Keep the number, direction and weight of the beam uniform in the above two algorithms. Then, compare the Dmean, conformity index (CI), homogeneity index (HI) of target, V5, V10, V15, V20, V25, V30, V35, V40, V45, V50, V55, V60 of the total lung and the Dmax of the spinal cord.
Results: In AAA and PBC algorithms the Dmean of target was 71.3 Gy, 70.Gy respectively (P = 0.056); The mean CI of target was 0.712, 0.700 respectively (P = 0.171); The mean HI of target was 1.105, 1.159 respectively (P = 0.003); The Dmean of Dmax of spinal cord was 40.07 Gy, 40.05 Gy respectively (P = 0.980); Comparing AAA algorithm with the PBC algorithm, the total MU number of beam increased 14MU (P = 0.046) in average; The V5, V10, V15, V20, V25 of total lung increased 5.45 (P = 0.000), 3.14 (P = 0.001), 2.11 (P = 0.003), 1.86 (P = 0.004), 0.99 (P = 0.023) in average. The V50, V55, V60 of total lung decreased 1.29 (P = 0.015), 0.89 (P = 0.000), 1.31 (P = 0.002), 1.69 (P = 0.000) in average.
Conclusion: Comparing with the PBC algorithm, the Dmean of target and the CI of target in AAA algorithm kept uniform. But the HI of target decreased. The area of lower dose (<25 Gy) increased, the area of higher dose (>50 Gy) decreased. We consider that AAA algorithm is more suitable for the treatment planning of lung carcinoma.

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Comparison of Intensity-Modulated Arc Therapy and Intensity-Modulated Radiotherapy Plans for Nasopharyngeal Carcinoma Simultaneously Integrated Boost Radiation Therapy

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Purpose: To compare the dosimetric differences between intensity-modulated arc therapy (ARC) and intensity-modulated tadiotherapy (IMRT) plans for nasopharyngeal carcinoma simultaneously integrated boost (SIB) radiation therapy.
Method and Materials: 10 nasopharyngeal carcinoma cases treated by SIB radiation therapy were selected. For each case, two treatment plans (ARC and IMRT) were generated using Varian Eclipse ver8.6 treatment planning system. Evaluate the dose parameters of targets, organs at risk (OAR), monitor units and treatment time, using dose–volume histogram (DVH).
Results: There were statistical differences (P < 0.05) between CI, but no statistical differences (P > 0.05) between HI for PTV, PTV1, PTV2. Mean dose of brain-stem decreased in ARC plan, while the maximum dose increased. The maximum dose of spinal-cord in ARC plan were higher than those in IMRT plan, but not statistically significant. There were statistical differences between V15, V20, V25, V30, V35, V40, V45, and V50 of normal tissues. The number of MU resulted to be MU-IMRT = 1308±213, MU-ARC =606±96. The MU of ARC plan were 702 less on average than IMRT plan.
Conclusion: The ARC was equal to IMRT on the target coverage and the dose of OAR, and better on CI. The ARC plan could reduce dose of normal tissues, machine monitor units and treatment time.

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Combined Modality Therapy Including Radiotherapy for Squamous Cell Carcinomas of Maxillary Sinus – a Retrospective Study

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Background: Squamous cell carcinoma of the maxillary sinus is locally infiltrating tumours, and most tumours are diagnosed at a locally advanced stage after the involvement of adjacent structures. Therefore, local control is the most important factor in obtaining a cure.
The purpose of this study was to assess the efficacy radiation therapy for Squamous cell carcinomas of the maxillary sinus at Kobe University Hospital retrospectively.
Materials and Methods: Between July 2000 and October 2010, 40 patients with Squamous cell carcinomas of the maxillary sinus were treated with radiotherapy at Kobe University Hospital. All of them were diagnosed histologically by biopsy, with no evidence of metastasis to distant sites. The median age of the patients was 67 years (range 34–86). The extent of disease was assessed by physical examination and CT or MRI. Most of the maxillary sinus tumours were diagnosed at an advanced stage: T4 in 26 patients, T3 in 11, and T2 in 3. Surgery was performed in 23 patients. Their treatment consisted of 30–50 Gy (median: 40 Gy) of preoperative radiotherapy with concomitant intra-arterial infusion of 5-fluorouracil and/or cisplatin followed by surgery. For tumours invading the skull base, preoperative systemic chemotherapy with radiotherapy was performed, instead of intra-arterial chemotherapy, then followed by skull base surgery. Treatment of the other 17 patients consisted of 60–70 Gy (median: 66 Gy) of radiotherapy with or without concomitant intra-arterial or systemic chemotherapy. Overall survival, relapse-free survival, and local control were evaluated using the Kaplan–Meier method.
Results: The median follow-up was 38 months (range, 2–115 months). The 3-year (5-year) overall survival, relapse-free survival, and local control rates were 66% (63%), 48% (39%), and 70% (65%), respectively. The 3-year overall survival rates for preoperative RT group and definitive RT group were 86% and 38%, respectively. The 3-year local control rates for preoperative RT group and definitive RT group were 86% and 45%, respectively. No severe late toxicities of Grade 3 or greater were recorded.
Conclusions: Our combined modality therapy including radiotherapy has showed favorable local control and survival outcome. Further accumulation of patients and longer follow-up would be warranted.

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Laryngo-esophageal Dysfunction-free Survival 2 Years After Primary Accelerated Radiotherapy of Larynx/Hypopharynx Carcinoma

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Background: Besides locoregional cure and survival, important goals of radiotherapy for head and neck cancer is good functional outcome of laryngeal and swallowing functions. In this study organ preservation is monitored 2 years after primary accelerated radiotherapy as laryngo-esophageal dysfunction-free survival (LEDFS) as defined by the Larynx Preservation Consensus Panel.
Materials and Methods: Primary accelerated radiotherapy was used in 230 cases with laryngeal cancer, 22 cases with hypopharyngeal cancer, and 33 with oropharyngeal cancer. Total dose ranged from 64 to 70 Gy in 5 weeks. The primary outcome is stated as the LEDFS 2 years after treatment. Events were death, local relapse, total laryngectomy and tracheotomy or permanent feeding tube at 2 years after treatment. Comparison with local control, overall survival and local laryngo-esophageal dysfunction-free survival (LLEDFS, only tumour related death and organ preservation) after 2 and 5 years was made with univariate and multivariate analysis. Patients with a tracheotomy and/ or feeding tube before start of radiotherapy were excluded. T3-T4 stage was seen in 42%, Age ranged from 32 to 87 years (mean 61 years). Eighteen percent of the patients was female. Positive nodes were seen in laryngeal, hypopharyngeal, and oropharyngeal cancer, in 21%, 73% and 67%, respectively (resp.). All patents were treated before august 2008, patients were prospectively followed. The mean follow-up was 52 months.
Results: Local control at 2 years and 5 years was 83% and 79%, LLEDFS was 75% and 71%, LEDFS was 64% and 51%, and overall survival was 78% and 60%, resp. After multivariate analysis, statistically significant independent factors on LLEDFS were tumour and nodal status only; for LEDFS, besides tumour and nodal stage, age, sex, and tumour site. Two years LEDFS for laryngeal, hypopharyngeal, and oropharyngeal cancer was 64%, 48%, and 72% resp.
Conclusions: LEDFS is a new endpoint of treatment for head and neck carcinoma. Due to the influence of overall survival in the form of death from all causes as event, influenced by age and sex, the definition is less suitable for retrospective or nonrandomized trials. Therefore we altered the definition and set up the LLEDFS, combining local control and function preservation, not influenced by not-cancer-related death. In our opinion, this best reflects best the most important treatment goal function preserved local control.