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Is micro-multileaf collimator really necessary to treat small intracranial tumors?

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Objective: To assess the real need of micro-multileaf collimator for fractionated radiotherapy in the treatment of small intracranial tumors.

Methods: BrainLAB micro-multileaf (3 mm/leaf) collimator and standard Siemens multileaf (10 mm/leaf) collimator were compared using 6-MV photos from Siemens Primus linear accelerator and the BrainSCAN 4.03 planning software. A cranial phantom was created by molding wax into a patient fixation mask. Two glass spheres of 15-mm and one of 22.5-mm diameter were inserted side-by-side in the center of the phantom (anatomical position of hypophysis). In order to use the same software (BrainSCAN 4.03) for the comparison, the Siemens multileaf (10 mm) collimator was simulated using three 3-mm BrainLAB micro-multileafs (9 mm instead of 10 mm) together. Using three different GTVs (two spherical volumes of 15- and 22.5-mm diameter, and one complex GTV composed by two 15-mm spheres side-by-side), we compared the dosimetry obtained by either one field or five non-coplanar fields using the 3-mm micro-multileaf collimator or the same geometry using the 9-mm standard multileaf collimator by turning the collimator by steps of 20 degrees (up to a total of 5 rotations [0, 20, 40, 60, 80 degrees] in single-beam situation or 3 rotations [0, 20, 40 degrees] using five non-coplanar beams) in order to smoothen the dose distribution.

Results: Our data demonstrate that, turning the collimator either every day or during the same fraction results with a dose distribution as good as the one obtained by the micro-multileaf collimator. Dose-volume histogram analyses reveal that the volume obtained by subtracting the volume covered by the 95% isodose from the exact volume of the GTV (V95% - VGTV) is almost identical either in one-sphere situation (0.000 ml vs. 0.008 ml; respectively), or in the two-sphere complex volume situation (0.050 ml vs. 0.056 ml; respectively) when comparing the 3-mm micro-multileaf collimator with the 9-mm standard multileaf collimator with collimator rotation.

Conclusion: We conclude that, in the treatment of GTVs 20 mm diameter or more, the physical dose distribution obtained either in the GTV or in the surrounding normal tissues is similar in both techniques. Using a good fixation system and turning the standard multileaf collimator by one or two steps of 20 degrees when using multiple non-coplanar fields, there is no need for 3-mm micro-multileaf collimator in order to treat either spherical or complex GTVs.

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Quantification of late complications after radiation therapy

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Purpose: An increasing number of patients survive cancer after having received radiation therapy. Therefore, the occurrence of late normal tissue complications among long term survivors is of particular concern.

Methods: Sixty-three patients treated by radical surgery and irradiation for rectal carcinoma were subjected to an unconventional sandwich therapy. Preoperative irradiation was given in four fractions of 5 Gy each applied within 2 or 3 days; postoperative irradiation consisted mostly of 15 x 2 Gy (range 20 to 40 Gy). A considerable proportion of these patients developed severe late complications (Svoboda et al., Radiother. Oncol. 1999; 53: 177-187). The data allowed a detailed analysis of complication kinetics leading to a new model which was tested using data from the literature.

Results: Data on late complications (grade * 3) were obtained for eight different organs with a follow-up of up to ten years. For the various organs, the percentage of patients being free from late complications, plotted as a function of time after start of radiation therapy, was adequately described by exponential regression. From the fit, the parameter pa was obtained, which is the percentage of patients at risk in a given year developing a complication in a given organ during that year. The rate pa remained about constant with time. Following sandwich therapy, the annual incidence of complications in bladder, ileum, lymphatic and soft tissue, and ureters was about the same (pa = 10 to 14% per year), whereas complications in bone or dermis occurred at lower rates (4.7 or 7.5% per year, respectively). From numerous data sets collected from published reports, three types of kinetics for the occurrence of late effects after radiotherapy were identified. Type 1: purely exponential kinetics; Type 2: exponential kinetics, the slope of which decreased exponentially with time; Type 3: curves composed of two components; a fast initial decline followed by an exponential decrease.

Conclusion: The results indicate that the hazard of developing late complications after irradiation remains about constant for many years. Thus, it might become necessary to change frequency and duration of follow-up after radiation therapy and to extend patient's information on long-term radiation risks.

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A prospective randomized, double-blind multicenter-trial on radiation therapy for neovascular age-related macular degeneration (armd)

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Purpose: The efficacy of external radiation therapy on choroidal neovascularisation (CNV) due to ARMD should be proved in a randomized, double-blind multicenter trial.

Methods: 205 pat were randomized either to treatment with 8 fractions of 2 Gy (n=101) or to a placebo-group with 8 fractions of 0 Gy external beam therapy (n=104). Pat. and physicians were blinded with regard to applied treatment. Only pat. with classic or occult CNV, visual acuity > 20/320 on the ETDRS-chart, lesion size < 6 disc areas, history of visual symptoms < 6 month and absence of foveal hemorrage were treated. Outcome measure was the difference in visual acuity between baseline and after 1 year follow up.

Results: 183 pat. were evaluable after 1-year follow up. The mean reduction in visual acuity was 3.5 + 4.7 lines in 88 pat. of the treatment group and 3.7 + 3.8 lines in 95 pat. of the placebo-group. This difference was statistically not significant (p=0.53; Mann-Whitney-U-Test). At 1 year 51.1% of treated pat. and 52.6% of the placebo-group lost 3 or more lines on the ETDRS-chart (p=0.88). Visual acuity in pat. with classic CNV dropped by 3.7 + 4.4 in 33 pat. of the treatment group vs. 4.3 + 3.9 lines in 36 pat. of the placebo-group (p=0.47). In pat. with occult CNV visual capacity dropped by 3.4 + 4.9 (n=55) in the treated - vs. 3.4 + 3.8 lines (n=59; p=0.8)) in the placebo-group.In the irradiated group no side-effects were seen.

Conclusion: The dose of 8x2Gy applied in 8 fractions provided no benefit as a treatment of classic or occult CNV due to ARMD after 1 year.

Gynaecological cancer

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International variations in the surgical management of advanced ovarian cancer between countries participating in scotroc: a large prospective international phase-3 trial

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Aim: International comparisons of ovarian cancer survival data have led many to conclude that the quality of treatment, particularly surgery, in the UK is significantly inferior to other parts of the world. However, these data come from cancer registries, are retrospective, and cannot be considered definitive. We have therefore conducted an indepth analysis of initial surgery carried out on patients in a large scale prospective international clinical trial [SCOTROC] in which information on all other biological and treatment variables should allow valid conclusions to be drawn regarding the impact or outcome of variations in surgical practice.

Methods: Surgical records were inspected in detail on 899 patients representing 83% of the 1077 patients entered into the SCOTROC trial [international prospective phase-III trial comparing carboplatin/taxol vs carboplatin/taxotere in advanced ovarian cancer]. 689 of these were from the UK and 388 from centres elsewhere in Europe, and in Australasia and USA.

Results: Systematic surgical differences were found between patients recruited by UK and non-UK centres. In FIGO stage 1C, non-UK centres were more likely to undertake aggressive staging procedures. Para-aortic lymphadenectomy was performed in 52% of stage 1C patients outwith the