spectroscopy at HFR. The reporting of the absorbed dose of each dose component and a biologically weighted dose is based on the actual blood boron concentration and applied monitor units.

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The elekta multileaf collimator (MLC). A universal soldier made to conform

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Purpose: To reduce the limitation imposed by the 1.0 cm leaf width to a level analogous to customised blocks. Apply techniques to small fields (2.0 cm), where block manufacture is most difficult and inflexible.

Methods: The MLC was originally investigated using a water tank and small 0.125 ion chambers. For small fields diodes and film were used. The leaf was investigated as a stand alone device over its full range of travel and all locations. Combinations of leaves and a range of geometric shapes were investigated. The leakage between leaves as applied to the patient was measured for both simply and worst case scenarios, using the test shapes.

Results: The effect of small penumbrae changes over the leaf travel, were considered negligible for clinical purposes. No field joins were used thus no hot or cold spots were introduced.

Conclusion: The basic techniques have been used clinically since 1994. Dose escalation and a head/neck trial using a stereotactic frame and small conformal MLC fields is now in progress.

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HDR boost brachytherapy with flexible implants in breast cancer

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Purpose: Brachytherapy is undergoing a resurgence based on new radiobiological concepts. The purpose of this study is to report the preliminary findings with a technique of high dose rate (HDR) boost brachytherapy with intraoperative implantation of flexible catheters following breast cancer conservative treatment.

Methods: Between August 1996 and August 1998, 43 cases with pathologically staged I-II breast cancer were treated with breast conserving surgery and intraoperative placement of 6 french hollow plastic catheters in the tumor bed under direct control. All patients received at least two sessions of 400 cGy each of them, starting 6 at 24 hours after surgery with a microSelectron HDR unit. This was followed by external beam irradiation to the whole breast at 200 cGy/day for 25 fractions.

Results: With a minumum follow up of 6 months and a maximum of 30 months, ninety three per cent of the patients had no radiogenous skin changes in the boost area. In 6.9% (3/43) minimal punctiform hipocromic lesions appeared at single puncture sites. Eighty nine per cent of the patients judged the cosmetic result as excellent or very good. There have been only one (2.3%) local recurrence presented as inflammatory breast cancer 23 months after treatment.

Conclusions: Perioperative irradiation has the radiobiological advantage of delivering high dose rate immediately upon removal of gross tumor to residual microscopical disease. Intraoperatively implantation increases the accuracy of placing the boost dose, avoiding geographical error. This technique seems to be a safe method to boost the tumor bed, without severe acute affects, eliminating the need of rehospitalization and anesthesia and shortening the overall treatment time. In conclusion, in spite of short follow up, perioerative HDR boost brachytherapy with flexible implants appears as a promising technique. A longer follow up is required to analize the local control rates.

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Past, present and future trends of boron neutron capture therapy (BNCT)

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The authors intend to provide an overview on the development of BNCT, to summarize the study design and the results of the ongoing clinical trials and to present the trends of preclinical and clinical research activities. The analysis of the disastrous clinical experiments in the 1950s and the reports on intraoperative BNCT in Japan led to a revival of the interest toward the promising principle of BNCT. Development of ^{10}B delivering drags, tissue uptake and toxicity studies, facility design, physical characterization of thermal, epithermal and fast neutron beams, radiobiological studies, and early clinical trials have been performed in the last years. The status of BNCT research is summarized, focusing the clinical studies in USA and in Europe. The widening of investigations at the enhancing of fast neutron therapy by BNCT will be analyzed. Necessary steps to develop standards for BNCT are suggested. Proposals for integrated efforts for future research, activities are addressed

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Hyperfractionated body stereotactic radiosurgery (BSR)

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Purpose: BSR is a non-invasive approach using an external stereotactic frame to deliver precision radiation most anywhere in the body. Like brain radiosurgery, treatment is directed at the defined target using multiple finely collimated radiation beams while minimizing dose to healthy, normal, surrounding tissues. The objective of this analysis is to determine the control rate of stereotactically treated primary and metastatic cancers in patients (pts) not amenable or not successfully treated with standard therapy.

Method: In the Western Hemisphere's first location in the first two years Of BSR, 834 pts completed therapy. 194 pts aged 23 to 86 years (mean 62) with 261 tumors having a volume range of 0.07 to 5,240 cc (mean 208.9 cc) were evaluable. Dose per fraction ranged from 250 to 1000 Centigray (cGy) (mean 767.6 cGy) delivered in 4 to 8 (mean 5.06) fractions. 38% of cancers were pulmonary with 38% metastatic and 62% primary. 29% of cancers were hepatic with 89% metastatic and 11% primary.

Results: Control is defined as cessation of growth, shrinkage or disappearance. 108 cancers (41%) ceased growing while 120 cancers (46%) decreased in size. 33 cancers (13%) increased in size. The overall extracranial control rate for BRS was 87%. Therapy was administered with little untoward effects.

Conclusion: BSR results in a high control rate especially considering pts had extensive previous treatment with surgery, radiation and chemotherapy. BRS is well tolerated and warrants further investigation for those seeking high dose precision radiation. Improvement to patient care should be expected to include better local control and palliation of symptoms.

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Advanced on-time treatment planning for intraoperative radiotherapy (IORT)

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Purpose: In IORT with electrons, it is common to use iso-ionisation catalogues acquired from water phantom measurements directly for the estimation of dose distributions. However, the actual surface of a treated region frequently differs significantly from the plain conditions in a phantom. This leads to large uncertainties in real dose delivery, especially when beveled cone applicators are used on curved contours.

Methods: A dedicated IORT planning system was developed, allowing for on-time calculation of the dose distribution beyond curved surfaces before treatment. Geometric information of the surface contour and tissue inhomogeneities (bones, lung) are acquired by a simple mechanical device