

Methods: 160 male Wistar rats were divided into six groups; a control (I, n = 20); a saline (II, n = 30) which received 1 ml intra-peritoneal (i.p.) NaCl; a sham irradiated (III, n = 20); a 5-FU (IV, n = 30), which received i.p. 5-FU (20 mg/kg) for five consecutive days; an irradiated (V, n = 40) which received fractionated irradiation to the whole pelvis to a total dose of 22 Gy, 5.5 Gy per fraction, in four consecutive days; and a concomitant 5-FU + irradiation (VI, n = 20) which received 5-FU as in group IV and irradiated as in group V. All groups underwent left colonic segmental resection and primary anastomosis 3 to 4 days following therapy. Within each group one half of the animals were sacrificed on the third postoperative day and one half on the seventh postoperative day. After the resection of the anastomotic segments, histopathological examination, hydroxyproline content (HP) and myeloperoxidase (MPO) activity were evaluated.

Results: Apposition of the wound edges of the mucosa and the muscularis were not influenced by the therapy. The amount of granulocytes was high, exudate and necrosis persisted, granulation tissue formation was delayed, and the amount of macrophages and fibroblasts were low, additionally MPO, and HP content were also influenced in groups IV, V, VI when compared to the other groups.

Conclusion: Anastomotic healing can be affected by the administration of pre-operative chemotherapy, irradiation and chemo-irradiation.

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POSTER*

Standards of reference in early breast cancer post-operative irradiation: The Italian association for radiation oncology (AIRO) document

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Purpose: According to the indication of the ESTRO document on "Quality assurance in radiotherapy", it is essential to establish clinical and technical guidelines to optimize radiotherapy practice. To this aim an AIRO Committee was charged to determine the standards of reference for early breast cancer (EBC) post-operative irradiation in Italy.

Methods: The AIRO Committee, supported by the Italian Association for Biomedical Physics (AIFB), was composed of radiation oncologists and medical physicists. Current management guidelines were derived from Committee's combined experience and knowledge, from review of the literature and from a Northern Italy 1996 survey. As their own general and specific standards of reference, the Committee widely utilised the 1991 European report on "Quality assurance in conservative treatment of EBC" and the 1996 Italian document on "Quality assurance in radiotherapy".

Results: Consensus guidelines were defined on pre-treatment evaluation, on treatment prescription, preparation and execution phases, with respect to both whole breast and tumor bed irradiation, on follow up and on Quality Assurance procedures. Recommendations were given for two levels of treatment: minimum requirements and desirable treatment level.

Conclusion: Standards of reference for EBC post-operative irradiation, reflecting the current national practice and adapted to the Italian situation and resources, have been established by the AIRO Committee.

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POSTER

Focused ultrasound thermotherapy: A new promising tumor treatment principle

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Purpose: Focused ultrasound (US) thermotherapy may become an option for ablation of deeply situated tumors while monitoring noninvasively by MRI.

Method: For assessing US therapy the Dunning prostate tumor transplanted to Copenhagen rats was used in vivo and bovine muscle ex vivo. The US system consists of an MR-compatible PZT disc transducer (intensity 2.5 kW/cm²). Treatments were performed in a 1.5 T whole-body MRI imager (Siemens) employing a T1 weighted TurboFLASH sequence (acquisition time 1.3 s) for temperature mapping and morphologic measurements.

Results: Focused US induces thermal lesions deep in tissue (<1 cm³ per single shot depending on US parameters). The time course of temperature elevation in the tumor and surrounding tissues was quantitatively evaluated by MRI online during US treatment (T_{max} = 75°C). It showed good agreement with invasive thermometry. Lesion geometry inside the tumors evaluated by

histology corresponded to the MRI controlled region. Tumor suppression by US was significant (p < 0.01) compared to untreated controls and correlated with the temperature level.

Conclusion: Selective tumor ablation while sparing healthy tissue by US-induced thermal surgery is feasible. MRI allows online monitoring of lesion geometry and temperature mapping. All localizations reached by diagnostic ultrasound are possible targets in humans. This would include lesions in the liver and breast.

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POSTER

Prophylaxis by radiotherapy for heterotopic bone after acetabular fracture surgery

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Purpose: A prospective study demonstrates the value of a combined protocol of early postoperative external beam radiation (EBR) in order to prevent heterotopic bone formation after reconstructive acetabular surgery.

Methods: From January 1991 to December 1996 eighty-one patients/pts./with acetabulum fractures were treated: 44 pts. conservatively and further 37 by reconstructive surgery and early continuous passive motion therapy (CPM). Twenty-two out of those 37 pts. were additionally irradiated postoperatively with 12 Gy total dose, 2 Gy/day.

Results: Eight non-irradiated pts. and 16 irradiated pts. were examined by X-ray 6 to 24 months after therapy. 13 (81.25%) out of 16 irradiated pts. were completely free of heterotopic bone formation. 3 (18.75%) out of 16 pts. developed grade 1 ossifications according to Brooker. All non-irradiated pts. developed heterotopic bone: grade 3 or 4 in 37.5%, grade 2 in 25% and grade 1 in 37.5%, respectively.

Conclusion: The adjuvant EBR led to a substantial reduction of both frequency and Brooker grade of heterotopic bone formation after acetabular fracture surgery.

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POSTER

Late cardiac effects after adjuvant radiotherapy following mastectomy in early breast cancer

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Purpose: To assess the occurrence and degree of late cardiac abnormalities after adjuvant radiotherapy (RT) following mastectomy in early breast cancer.

Patients and Methods: Ninety women without relapse included in a former randomised trial of early breast cancer with or without RT ± cyclophosphamide were examined with myocardial scintigraphy and echocardiography 10–17 years after therapy. Thirty-four patients with left-sided RT, 33 with right-sided RT and 23 without RT. The RT had included the chest wall and regional lymph nodes, target dose 38–48 Gy. At follow up all patients were below 65 years.

Results: Abnormal findings were recorded for ECG (14 pts), exercise test (5 pts), myocardial scintigraphy (6 pts), thickening of valve cusps (14 pts) and mild valvular regurgitation (20 pts). Although no significant differences between the 3 study groups were found, higher relative frequencies of abnormal findings were observed in the RT groups. All patients had normal systolic function. Regarding diastolic function the E/A ratio was significantly lower in irradiated patients regardless of side. No difference in deceleration time or in cardiac dimensions was noted between the 3 study groups.

Conclusion: After median 13 years only minor cardiac effects which might be related to adjuvant radiotherapy following mastectomy in early breast cancer were noted.

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POSTER

Portal and verification imaging of electron beams by digital storage phosphor radiography

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Purpose: Portal or verification imaging of electron beams with various energies is often difficult due to the inadequate dose range of film material, the need of use of several film materials and the variation of the delivered dose per fraction.

Methods: From 1991 to 1995, a standard digital storage phosphor radiography system was used for the beam documentation in 47 patients with electron portals from 6–12 MeV. The delivered doses were in a range of 50 to 200 cGy per fraction for verification imaging and in the range of 1 to 4 cGy for portal imaging within the linacs electron portal imaging mode. 38 patients underwent electron beam verification, 9 patients underwent electron beam portal imaging.

Results: The images obtained were of excellent quality. The image contrast was not dependent on the electron energy, neither for portal nor for verification imaging. By methods of electronic contrast enhancement, it could be optimized in each case.

Conclusions: Digital storage phosphor radiography is at present the most suitable method at all to perform electron beam documentation.

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POSTER

Electronic portal imaging in the detection of setup variation in daily treatment of patients undergoing radiation treatment for prostate cancer

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This study tested the utility of electronic portal imaging (EPI) in detecting field placement errors (FPE) and in determining the statistical nature of FPE in patients undergoing radiotherapy (RT) for prostate cancer at our facility.

20 patients treated using a four-field technique were studied. Port films (PF) were taken in the 1st, 3rd and 5th weeks of treatment and FPE corrected on the basis of these. Set-up 'corrections' during RT were recorded. Daily EPIs were also performed and compared with a sim film by 2 observers to determine FPE. Interobserver differences were quantified. The mean and standard deviation (SD) of FPEs in 3 directions (X, Y, Z) were determined. Set-up corrections were compared with the corrections suggested by the daily EPIs.

10 set-up corrections were made on the basis of PFs. Each patient had a mean of 26.7 and 26.2 EPIs taken of the AP port and lateral port respectively. The correlation coefficient between the observers' FPEs was 0.80. The inter-observer difference SD was between 0.88 and 1.67 mm, depending on the direction. The observed set-up FPE for all patients varied between -0.33 ± 2.3 (mean \pm SD) and -1.12 ± 3.5 mm. The 'recorrected' set-up FPE for all patients varied between -0.08 ± 2.45 and 2.13 ± 3.7 mm. In general, the mean 'recorrected' FPEs for the first 4 EPIs were not different from the subsequent mean variation. In total, discounting any corrections, 6 patients had a systematic FPE in any direction of greater than 3 mm; after correction on basis of the PFs, only 3 had a systematic error greater than 3 mm.

EPI appears to reproducibly detect setup variation in prostate fields. FPE was relatively small, but varied depending on direction. Changes made on the basis of PFs generally reduced the FPE observed on the EPIs.

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POSTER

The role of radiotherapy in esophageal cancer management

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Purpose: The results of radiotherapy with or without surgery are presented.

Methods: From February 1989 to September 1993, 170 untreated cases of squamous cell carcinoma stages II–III, arising from the thoracic esophagus have been treated in the institute. One group of 73 patients were treated by external beam irradiation (EBRT) to a dose 30 Gy/5 Gy per fraction/6 fractions per week. Intracavitary brachytherapy (IBT) was performed in 2–3 days after EBRT. The average dose delivered by IBT (Selectron, source ¹³⁷Cs, pellets LDR-MDR) was 15 Gy, the dose per fraction was 5 Gy twice per week, calculated at 0.5 cm below esophageal mucosa. For 47 of these patients surgery (S) was carried out after 3–4 week's rest. For 51 patients of 3th group surgery have been fulfilled within 3–4 weeks after EBRT only. Another group of 36 patients were treated by EBRT to a dose of 51–54 Gy/17–18 fractions/3.5 weeks.

Results: There was remarkable increase to the end of 1 year in relief of dysphagia and local control in groups with IBT. The level of benign

radiation-induced esophageal ulcerations and strictures in IBT-groups did not exceed such in EBRT-groups. The survival rate from all groups are representing in the table.

Conclusion: Intracavitary radiotherapy with or without surgery is safe and effective treatment method for patients with esophageal cancer.

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POSTER

The factors which influence the cosmetic outcome in breast cancer patients after conservative surgery and radiotherapy

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Purpose: Cosmetic outcome among patients with breast cancer after breast conserving surgery and radiotherapy were evaluated and the factors influencing the cosmesis were assessed.

Methods: Two hundred nine patients with breast conservative surgery who referred to Ege University Dept. of Radiotherapy between January 1989 and December 1995 were evaluated retrospectively, cosmetic outcome and the factors influencing the cosmesis were evaluated.

Results: The age range was between 18–80 years (median 47 years). Seventy (33.6%) patients had quadrangectomy, 82 (38.9%) had wide local excision and 57 (27.5%) had tumorectomy. According to the stages 9 patients (4.3%) were Stage 0, 69 (33%) were Stage I, 69 (33%) were Stage IIA, 37 (17.7%) were Stage IIB, 17 (8.2%) were Stage IIIA, 8 (3.8%) were Stage IIIB. The cosmetic results were excellent in 21.1% (44 patients), good in 50.2% (105 patients), moderate in 18.7% (39 patients), poor in 10% (21 patients).

Conclusion: Patient's age younger than 40 years ($p = 0.035$), tumors smaller than 2 cm ($p = 0.0007$), breast diameter less than 19 cm ($p = 0.033$) tumorectomy ($p = 0.0004$), incision type according to NSABP recommendations ($p = 0.001$) were the factors influencing excellent cosmesis while radiotherapy volume ($p = 0.028$), dose ($p = 0.310$), boost type ($p = 0.665$), chemotherapy ($p = 0.885$) and hormonotherapy ($p = 0.982$) had no effect on cosmesis.

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POSTER

Tumor regression during external radiotherapy as a predictive factor of local control in glottic cancer

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The aim of this study is to assess the influence of complete tumor regression on the results of radiotherapy in patients with glottic cancer. One hundred patients with histologically confirmed squamous carcinoma of glottis were treated exclusively with Co-60 between 1984–1990 (T1 44pts, T2 31 pts, T3 25 pts). The regression had been estimated after the dose 40–45 Gy than after completing the prescribed dose 60–66 Gy and finally at the end of treatment. For patients who did not show the full regression after 60–66 Gy the total dose was usually boosted up to 70 Gy.

The study showed that 13% of patients had radioresistant tumors, 35% very radiosensitive, 53% were in the group of medium radiosensitivity. The predicted probability of 30 months survival without symptoms in patients with complete regression at the end of therapy was notably different in particular stages of clinical advancement. 30 months actuarial survival without symptoms was achieved in 69% with T3. In T2 77.5% and T1 84%. 30 months symptom free survival has been observed in 61 patients: T1 32/44 (73%), T2 20/31 (65%), T3 9/25 (36%). 30 months symptom free survival in 87 patients with CR at the end of therapy was in T1 32/42 (76%), T2 19/27 (70%), T3 7/18 (39%).

Conclusions: The complete regression of tumor at the end of treatment has very significant prognostic value.

Among radioresistant tumors (with not full regression (PR) at the end of treatment) prevailed cases with stage T3 but there were also some poor responders among T2 and T1 patients. In the group of T2 patients the rate of poorly responding tumors was 10–15%. That percentage in the stage T3 is estimated to be 2–3 times higher.

	EBRT+IBT+S	EBRT+IBT	EBRT+S	EBRT
N of patients	47	36	51	36
1-survival rates	80.9%	69.23%	45.1%	36.11%
3-survival rates	25.9%	11.54%	8.8%	8.33%