

**Material and methods:** From 1994 to 2002, the medical records of 1078 female patients with breast cancer were examined in order to identify those with histopathologically positive axillary lymph nodes and extranodal tumor spread (n=301, 28%). Ninety-one (30%) out of 301 patients were identified as having  $\leq 3$  lymph nodes involved and 70% of patients 4 or more lymph nodes. Patients were postoperatively treated with adjuvant irradiation. Irradiation was given to the breast (n=160) or thoracic wall (n=141) up to a total dose of 50 Gy (range, 46–54 Gy). Regional irradiation was given to patients with  $\geq 4$  positive axillary lymph nodes. Chemotherapy was administered to 70% (n=210) patients, hormonal therapy to 53% (n=160) and combined systemic treatment to 26% (n=78) patients.

**Results:** The median observation time was 34 months (range, 2–99). The median age of the patient population was 58 years (28–84 years). In 91% of patients more than 10 axillary lymph nodes were removed. Of the 28 (9.3%) patients with a recurrence, 6.6% had an isolated local relapse, 1% experienced a regional failure (isolated axillary, 0.7%; isolated supraclavicular 0.3%) and 1.7% had a simultaneous local and regional failure (local+supraclavicular, 0.7%; local+axillary, 1%). Subsequently 27% of patients experienced distant failure.

**Conclusion:** Isolated axillary failure is uncommon among patients with positive axillary lymph nodes and extranodal spread. Balancing the risks and benefits of adjuvant radiotherapy, we conclude that axillary irradiation should not routinely be given following an adequate axillary dissection.

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### Long-term radiation sequelae after breast conserving therapy in women with early-stage breast cancer treated with 2.5 Gy per fraction

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**Background:** Breast irradiation after lumpectomy is an integral component of breast-conserving therapy (BCT). An optimal fractionation schedule for breast irradiation has not been uniformly accepted world wide and altered fractionations are discussed. We examined retrospectively late toxicity of a 22-day fractionation schedule (2.5 Gy per fraction to 55 Gy, 4x/wk, without additional boost).

**Patients and Methods:** Between 1988 and 1993 1662 patients with early-stage breast cancer (pT1-2, pN0-1, cM0) were treated with adjuvant radiation therapy (85% with 6 MV photons) using 2.5 Gy single fraction size to a total dose of 55 Gy, 4x/week. During their last follow-up visit late toxicity was assessed in 345 relapse free women using the LENT-SOMA criteria (mean follow-up 9 years, range 6.5–13 years).

**Results:** Moderate and severe toxicity (grade 2; grade 3 and 4) were observed as follows: pain (14%; 2%), breast edema (2%; 0%), breast fibrosis (41%; 10%), telangiectasia (7%; 10%), arm edema (1%, <1%), atrophy/ retraction (22%; 8%), skin ulceration (<1%; 0%). Six percent of women were using pain medication at the time of follow-up and 4% were regularly undergoing lymph drainage treatments.

**Conclusion:** The LENT-SOMA criteria are a useful tool for assessing radiation induced late toxicity after BCT using 2.5 Gy fraction sizes to a dose of 55 Gy. In this study population, late radiation effects do occur not infrequently. However, in the majority of patients they are asymptomatic when scored using the LENT-SOMA criteria.

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### Post-mastectomy adjuvant internal mammary lymph node irradiation – benefit and cardiac toxicity: an Indian experience

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**Background:** Worldwide there is no consensus as to whether post-mastectomy internal mammary node (IMN) irradiation should or should not be used in medial or central quadrant (m/c) breast cancer patient.

**Aim of study:** The present study was aimed to evaluate the benefit of inclusion of ipsilateral IMN field during post-mastectomy adjuvant radiotherapy in axilla positive m/c tumor and to analyze the cardiac effect amounting from radiation of this additional anatomical area.

**Material and method:** After simple mastectomy with level I/II axilla dissection, IMN radiation was considered only in m/c disease with axilla involvement. Out of total 1068 patients receiving post-mastectomy radiation in Cobalt-60, 203 cases had axilla positive m/c disease and were studied between June 1995 and November 2002. Of these 203 cases, 94 Pt.s (Left breast cancer in 43) received IMN radiation. Remaining 109 Pt.s (Lt breast = 55) did not receive IMN. Total dose was 45 Gy/20 fractions/4 wks. All patients received 6 cycles of adj. chemotherapy (FAC or AC). All patients had CT-based treatment planning in 3D TPS to optimize the IMN coverage. Volume of heart irradiated and dose received were quantified individually from integral DVH. Cardiac effects were studied by

ECG, CXR, Doppler Echocardiogram at the start of radiation, on completion and then 6 monthly. TMT and 24 hr. Halter monitor were done in selected cases.

**Summary of result:** In a median duration of F.U. of 39 months, 4 patients had chest wall recurrence – 2 received IMN and 2 did not. **IMN recurrence was observed in none whether received IMN radiation or not.** Regarding cardiac effects, 2 out of 43 left breast patients receiving IMN developed constrictive pericarditis, 3/43 had LV dysfunction (EF<50%), 3/43 had congestive failure and no toxicity in 55 Lt breast cases not receiving IMN (p<0.001). So significant late cardiac toxicity was observed in 8/43 Lt breast IMN-treated and in 0/55 Lt breast IMN not treated cases (p<0.001). It was also absent in Rt breast radiation **even if received IMN.** Analysis of compiled integral DVH data revealed 50% heart volume was exposed to 22–25 Gy in IMN treated vs. 8–10 Gy in IMN not treated Lt breast patients.

**Conclusion:** In centers equipped with only Cobalt 60 and with no facility of IMRT or electron, addition of IMN portal is not justifiable at least in left breast cancer even in axilla positive medial quadrant disease as it may invite fatal late cardiac toxicity *without any additional gain in loco regional control.*

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### Pulsed dose rate peri-operative brachytherapy (PDR BT) as an interstitial boost in conservative treatment (BCT) of breast cancer. Preliminary results

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**Background:** Reduced risk of local recurrence in patients treated with BCT including a boost dose to the tumor bed in addition to whole breast irradiation (EBRT) was confirmed in a large randomized trial. In practice, the extent of boost tumor volume may be incorrect if the tumor bed is determined using clinical parameters. The intra-operative implantation of BT catheters allows for decreasing the risk of "geographical miss" in determining the target volume. Despite its favourable radiobiological features, PDR BT has rarely been used in breast cancer. We present here our early experience with this method employed as an interstitial boost.

**Material and Methods:** A total of 40 consecutive T1–3N0–1M0 breast cancer pts (4 pts with T2–3 tumor after prior chemotherapy) who underwent BCT between 05/2002 and 08/2003 were analyzed. Breast sparing surgery consisted of primary segmentectomy (27 pts) or reexcision after excisional biopsy (13 pts), full-axillary sampling in all but 2 pts with negative sentinel node, immediate tumor cavity reconstruction, and intra-operative BT tube placement. Peri-operative PDR BT of 15 Gy (1 Gy/pulse/h) was administered with Paris system rules and volume optimization technique using BT planning system PLATO. BT was followed by whole breast EBRT after the final histology had been obtained.

**Results:** Tube implantation (mean 9, range 5–13) prolonged time of surgery by no more than 20 minutes. Two-plane implant was used in 38 pts (95%) and one-plane in the remaining 2. BT started the day after implant placement in 38 pts and was delayed by 1–3 days in 2 pts. Temporary peri-operative breast infection in one reexcised case and fat necrosis in another one were the only side effects observed. The median period between BT and whole breast EBRT was 12 days (range, 10 to 31). Subsequent breast EBRT was abandoned in 3 pts (7.5%) including one pt with multiple pathological factors implying the superiority of mastectomy, one with final histology of LCIS and one with no malignant tumor; all these pts were diagnosed by fine needle aspiration cytology.

**Conclusions:** Peri-operative PDR BT with tube implantation at the time of surgery is a safe and convenient boost method. In some pts therapeutic strategy has to be verified after the final histology is obtained. Therefore, this approach necessitates careful pt selection and preoperative histological diagnosis.

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### The effect of exercise program on the fatigue of cancer under external radiotherapy

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Cancer fatigue is the commonest complication during and after cancer treatment, especially radiotherapy. It is possible that exercise with its physical and emotional effects might be useful in reducing cancer fatigue. This study was intended to convey the effects of the scheduled exercise program on the fatigue of cancer patients under radiotherapy and to compare it with a control group. The experimental group was trained for four weeks; the first week before the program; the second and third weeks were the exercise week when the subjects were required to have exercises for 20 minutes each day followed by a 10 minute bed rest and deep slow