

in a Cox regression analysis, the hazard ratio for distant metastases was 0.69 (95% CI 0.52 to 0.92,  $p = 0.012$ ). Furthermore, the CCCC haplotype formed by 5 polymorphisms upstream of the coding sequence including the -634G>C polymorphism demonstrated a significant association with distant metastases (HR 0.655, 95% CI 0.487 to 0.882;  $p = 0.004$ ). In a multivariate analysis including tumor stage, tumor grade, initial lymph node involvement, hormone receptor status and HER2neu status as potential confounders, the CCCC haplotype remained a significant predictor of distant metastases (HR 0.614, 95% CI 0.416 to 0.906;  $p = 0.014$ ).

**Conclusion:** We conclude that VEGF gene polymorphisms and haplotypes may influence the risk of developing distant metastases in postmenopausal breast cancer patients.

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#### Frequency and Anatomical Characteristics of Involved Regional Lymph Nodes in Recurrent and Advanced Breast Cancer and Its Impact On Target Definition for Radiotherapy

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**Background:** The role of radiotherapy (RT) has been well evaluated in the multidisciplinary management of breast cancer (BC). Local-regional RT is typically delivered with traditional field borders. An analysis of the frequency of lymphatic nodal involvements with corresponding anatomical extent in recurrent and advanced BC would help to evaluate the adequacy of target definition with regard to contour guidelines.

**Materials and Methods:** Recurrent or advanced BC patients with CT images to cover the whole regional nodes at the time of recurrence or staging prior to systemic therapy were eligible. Additional MRI or PET-CT images were collected if presented. The regional lymph nodes were categorized into 8 anatomical substructures: medial and lateral-supraclavicular (Sc-M, Sc-L); axilla (ALN)-I, II, III; infraclavicular (Ic); Rotter's nodes (RN) and internal mammary nodes (IMN). Frequency of involvement and the anatomical characteristics were analyzed.

**Result:** A total of 182 regional recurrent pts and 26 advanced BC pts from July 2003 to Jan. 2010 entered study, with 352 anatomical substructures of involved nodes. The frequency of involvement includes: Sc-M: 71(20.2%), Sc-L:38(10.8%), ALN-I: 43(12.2%), ALN-II: 38(10.8%), ALN-III and Ic: 58(16.5%), RN: 44(12.5%), IMN: 60(17.0%). Apart from IMN, in pts received axillary dissection, 85.8%(200/233) had recurrent nodes cranial to the axillary vein (AV), while in advanced pts without axillary dissection, ALN-I/II remained the most frequently involved regions: 39.0% and 18.6%. 58/60 of the involved IMN occurred within the first 3 intercostal spaces. The average depth from the center of the involved nodes in ScM and Sc-L was: 35.37±10.25 mm and 47.29±18.52 mm respectively, with 62.0% and 76.3% of these measured above 3 cm. The average distance from the center of involved IMN to the midline was 29.4±6.7 mm, which was also 5.5±4.8 mm to internal mammary vessels (IMV) laterally and 5.3±4.5 mm deeply.

**Conclusion:** Identification of involved regional nodes in recurrent and advanced BC pts would help to better understand the natural history of lymphatic spread. The data observed in our series confirms that current target definition of is consistent with the potential risk of regional nodes. Sc and axillary nodes cranial to the AV should be considered the primary risk target in post-operative radiotherapy after axillary dissection. Individual treatment planning would be feasible with increasing knowledge of nodal involvement.

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#### Perioperative Interstitial Brachytherapy as a Boost in Breast Cancer Conserving Therapy

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**Background:** The aim of breast-conserving treatment (BCT) in breast cancer, consisting of wide local excision (WLE) and whole breast radiation (WBR), is to obtain locoregional control of disease. Since a considerable percentage of local recurrences after BCT occurs close to the original tumor bed, WBR is supplemented with a boost on the original tumor bed. Application of perioperative brachytherapy allows more precise deposition of boost radiation energy to the lumpectomy cavity in a shorter period of time, as compared to conventional radiation schemes. This study evaluated treatment and clinical outcomes of patients with early staged breast cancer who received perioperatively placed catheters for Iridium-192 based brachytherapy.

**Material and Methods:** 107 breasts in 105 patients with cT1-2 non-lobular breast cancer were treated between 1996 and 2009 with BCT, including WLE combined with perioperative brachytherapy using Iridium-192 (15 Gy applied with low dose rate or 9 Gy with high dose rate) followed by whole breast irradiation (50 Gy in 5 weeks). Outcome analysis included treatment toxicity (according to Common Terminology Criteria for Adverse Events), local recurrence rate, disease-free survival, and overall survival.

**Results:** Median follow-up was 6.7 years (range 0.50-14.8). Mean age was 50.2 years (±10.5). Mean tumor diameter was 15 mm (±8 mm). Three patients (2.8%) developed a true in field recurrence. Five- and ten-year local recurrence free survival was 98% and 87%, respectively. Five- and ten-year disease-specific survival was 94% and 84%, respectively. Five- and ten-year overall survival was 92% and 78%, respectively.

Acute complications consisted of wound infections of the lumpectomy site ( $n = 3$ , grade 1), haematoma ( $n = 3$ , G1), venous bleeding due to removal of catheters, necessitating surgery ( $n = 1$ , G3), radiation induced mastitis ( $n = 2$ , G1). Late complications were fibrosis ( $n = 19$ , G1), temporary pain ( $n = 6$ , G2), circumscribed teleangiectasia ( $n = 6$ , G1).

**Conclusions:** Local recurrence rate and local toxicity after perioperative interstitial brachytherapy and whole breast irradiation for breast cancer appear to be similar to that seen after external beam radiotherapy schemes in BCT. The main disadvantage is the fact that the final histological reports concerning radicality are not available during the brachytherapy treatment. The advantages are the ability to visualize the excision site at the time of implantation and reduction of outpatient treatment.

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#### Palliative Radiotherapy in Patients with Metastatic Breast Cancer - Rates of Utilization, Distance Travelled and Incurred Costs

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**Background:** Palliative radiotherapy (PRT) is a well recognised treatment for the successful relief of symptoms associated with metastatic breast cancer (MBC). Improvements in up to 80% of MBC patients with complete resolution of pain in a third are recognised. Over half of female patients with MBC receive at least one course of palliative radiotherapy. Distance from radiotherapy centre is associated with reduced rates of PRT despite likely patient benefit. Our aim was to unveil the proportion of patients with MBC attending oncology clinics who received PRT, distance travelled and overall cost.

**Materials and Methods:** By reviewing the notes of 76 patients with MBC attending outpatient clinics between August 2010 and February 2011 at Wansbeck District General Northumbria, we recorded all courses of PRT received from the diagnosis of MBC for each patient. Number of attendances for delivery of treatment at the Newcastle Centre for Cancer Care (NCCC), fractionation schedule, technique used and distance travelled were recorded. IMRT costing was excluded. An estimated cost of each NCCC course of treatment was made.

**Results:** MBC patients comprised a median of 36% of outpatient clinic appointments, attending a median of 4 appointments each. 40 (52.6%) of these patients received at least one course of PRT since the diagnosis of MBC, totalling 463 PRT fractions with a median of 10 fractions per patient. 92.3% of patients' PRT was delivered with standardised single or parallel opposed field techniques. 3-D conformal IMRT techniques were required for 2 patients. One patient with bone metastases received stereotactic radiotherapy in a different radiotherapy centre. PRT was administered to bone in 31 (80%) of cases, 10 (27.5%) to soft tissue and 7 (17.5%) to brain. 8 (20.5%) of the patients were re-treated, 6 (15.4%) had one and 2 (5.1%) had two re-treatments. 90% of re-treatments were to bone. The total cost including transport was £37,632. The mean cost was £990 (median £800) per patient with an average price of £100 per fraction. Average distance travelled to the NCCC was 20.9 miles (range 3-63 miles).

**Conclusion:** Patients with MBC comprise a large proportion of outpatient consultations. Our utilization of PRT is comparable to a limited number of published reports. We show that PRT is an inexpensive and frequently used modality when treating symptomatic metastases in a majority of cases. Despite the average distance travelled to the NCCC this was not a barrier to PRT.

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#### Feasibility Study On Pre-operative MRI-guided Irradiation in Breast-conserving Therapy

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**Background:** Today's radiotherapy (RT) after breast-conserving surgery is prone to uncertainties due to high interobserver delineation variation