Using the information from U/S, the field size, the electron energy and the prescription point were determined. The patients then underwent computed tomography (CT) scan on which the tumour bed, as visualized on CT, was contoured. A dose-evaluation volume (DEV), defined as the tumour bed with a 1-cm margin, cropped at the chest wall and at 5 mm of the skin, was created. The U/S boost plan was then reproduced on the CT scan. Another plan, using the CT data, was also produced. The dosimetric characteristics of both plans, including coverage of the tumour bed and DEV, were assessed and compared.
Results: The mean tumour bed volume was 8.18 cm^3, while mean DEV volume was 42.73 cm^3. The mean tumour bed depth determined by US was 3.06 cm (range = 1.0−4.7 cm) compared to 3.47 cm (range = 0.86–7.06 cm) as defined by CT. Mean dose to the DEV was significantly lower with US, as compared to CT-based planning (9.8 Gy vs. 10.5 Gy; $p = 0.04$). As well, CT planning provided significantly higher DEV V90% (99.2% vs. 84.4%; $p < 0.0002$) and V95% (97.6% vs. 69.5%; $p < 0.002$) than U/S based planning. The maximum dose to the breast was elevated with both techniques (11.7 Gy for both techniques; p=NS). Adequate coverage of the DEV was defined as the entire DEV covered by at least 90% of the prescribed dose. It was achieved in 93.33% of CT plans but only 13.33% of U/S plans. In terms of tumour bed volume, adequate coverage was achieved in 100% of CT plans, but in only 46.67% of U/S plans.
Conclusions: Our data indicate that US planning of the tumour bed boost in breast cancer is less accurate than CT-based planning. We found that U/S planning does not provide adequate coverage of the tumour bed in a majority of patients. Although the clinical implications of our findings, in terms of local control, are unclear at this time, we recommend that tumour bed boost in breast cancer be planned using CT-guidance rather than ultrasound.

5124 POSTER

A Phase II Randomized Controlled Trial of Manuka Honey as Prophylaxis Against Radiation-induced Dermatitis in Breast Cancer Patients

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Background: Radiation dermatitis is a common side effect in patients undergoing breast or chest wall irradiation, with grade 2 dermatitis reported in up to 50% of patients. Many topical agents are used in clinical practice, but no single agent has been proven to prevent radiation dermatitis. Manuka honey (Leptospermum scoparium), local to New Zealand, has been proven to have wound healing and anti-inflammatory properties, due to an unidentified phytochemical. There is evidence to support the use of honey in the healing of moist desquamation, and for radiation-induced mucositis. This study was designed to determine the efficacy of manuka honey in preventing radiation-induced dermatitis in breast cancer patients undergoing radiotherapy (RT). The honey formulation used contained active manuka honey as the only ingredient (1 g/g), UMF (Unique Manuka Factor) of 18.
Materials and Methods: Patients with invasive breast cancer or DCIS undergoing adjuvant external beam RT were randomly assigned to either standard aqueous cream or manuka honey in a non-blinded fashion. A range of radiation schedules were accepted. The topical treatments were applied twice daily from the 1st day until 10 days post RT. Toxicity was scored by visual inspection using the RTOG acute toxicity scale and digital photography. Independent assessment of the photographs was performed by a clinician blinded to the treatment allocation. Patient-reported outcomes were also collected.
The primary study endpoint was the incidence of radiation dermatitis, $\geqslant$ grade 2. Secondary endpoints included the duration of dermatitis, ease of application, comfort and acceptability of the intervention.
Results: A total of 81 patients were enrolled in this study between October 2007 and September 2008. 43 patients received manuka honey and 38 patients received standard aqueous cream. There was a lower incidence of grade $\geqslant$ 2 dermatitis in the honey-treated group compared to the group using aqueous cream (37.2% vs 57.8%; $p = 0.08$). There was a trend towards a lower incidence of grade $\geqslant$ 2 dermatitis lasting longer than 1 week (shorter duration) in patients treated with honey compared to aqueous cream (14.0% vs 28.9%; $p = 0.1$). Ratings out of a scale of 10 for the ease of application (9.3 vs 7.1; $p < 0.05$), comfort (9.0 vs 6.1; $p < 0.05$) and overall acceptability (9.2 vs 8.6; $p = 0.04$) were significant, in favour of the aqueous cream over honey.
Conclusion: This trial demonstrated potential reductions in the incidence and duration of clinically significant radiation dermatitis in breast cancer patients. Although the honey was not as comfortable or easy to apply, the overall acceptability rates were similar. A larger phase III study is warranted to further investigate the potential benefits of honey, although development of an improved topical honey product may be required.

5125 POSTER

Five Year Clinical Outcome in 109 Women With Clinically Palpable Tumours (1−3 cm) Treated With Accelerated Partial Breast Irradiation Using Interstitial Brachytherapy

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Background: To evaluate the local control, cosmetic outcome and late sequelae in women with palpable tumours of 1−3 cm treated with accelerated partial breast irradiation (APBI) using high dose rate (HDR) interstitial brachytherapy.
Materials and Methods: During May 2000 to May 2005, 109 women (median age 56 years) participated in a prospective study of APBI using interstitial brachytherapy as the sole modality of radiation for early breast cancer. Women with a single tumour up to 3 cm without diffuse microcalcification and clinically negative axilla were considered suitable. Brachytherapy was done either intraoperatively during the breast conserving surgery or postoperatively. Tumour bed demarcation was done with radio-opaque clips placed during surgery, CT scans, ultrasonography and/or fluoroscopy. Tumour bed cavity with a 1−2 cm margin was treated, using 2−4 planes to a dose of 34 Gy in 10 fractions over 1 week with twice daily fractionation using high dose rate iridium source.
Results: A majority of the patients (67/109 patients; 62%) underwent an intraoperative implant during their primary surgery. Rest of the patients underwent a postoperative implant. Implant procedure was tolerated well by all the patients. In 9 patients, only 3 or 4 fractions of brachytherapy were delivered as a tumour bed boost component of the treatment and followed by 45 Gy/25# whole breast radiation therapy for following reasons: Extensive intraductal component positive (4) positive nodes and EIC (2), multiple nodes positive and lymphovascular invasion (1), lobular cancer (1) and poor implant coverage (1). At a median follow up of 64 months, the actuarial 5 year local control rate of the 100 women treated with APBI was 95.5%. Five year actuarial disease free survival and overall survival was 91% and 95.5% respectively. Late sequelae included fat necrosis in 14 (13%) and a non-healing ulcer in 1 patient. Cosmesis was good to excellent in 60% of the patients.
Conclusion: The local control rates and overall survival even in clinically palpable tumours treated with APBI are very encouraging. The late sequelae of APBI in our series are comparable to the published literature.

5126 POSTER

Long Term Outcome of High Grade Invasive Breast Cancer Patients Treated With Hypofractionated Radiation − the McGill University Experience

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Background: Recently published data suggests that hypofractionated radiotherapy (HypoRT) might be detrimental to the local control of patients with high-grade breast cancer. We evaluated the long term outcome of patients with high grade breast cancer who received adjuvant hypoRT and compared the risk of recurrence to patients who received conventionally fractionated RT (ConvRT).
Materials and Methods: A list of all invasive breast cancer patients treated with whole breast hypofractionated RT, between June 2002 and November 2007 was obtained from the McGill University Health Centre Radiation Oncology database. Sixty-three patients with high grade breast cancer treated with 42.5 Gy in 16 fractions, with or without a tumour bed boost, were found. A retrospective review of the pathology, treatment and outcome was performed, and the data was compared to forty-one patients with invasive, high grade breast cancer, who received 50 Gy in 25 fractions to the whole breast, with addition of a tumour bed boost.
Results: Mean age was 55.3 years (range 28−94 years) in the HypoRT group and 49.1 (range 30−79 years) in the ConvRT group. Mean follow-up was 3.7 years in the HypoRT group and 4.8 years in the ConvRT group. The proportion of patients with stage T2 disease was 34.9% in the HypoRT group, with a mean tumour size of 1.8 cm. In the control group, 56.1% of patients had stage T2 breast cancer, with a mean size of 2.4 cm. In terms of nodal disease, 33.9% of patients in the hypofractionated group had nodal disease, compared to 47.5%. There were 75% of patients who received chemotherapy in the hypofractionated group, comparable to 80.5% in the control group. All patients in the control group received a

boost to the surgical cavity varying in dose between 7.5 Gy and 16 Gy, whereas 75% of patients in the hypofractionated treatment group received a boost, varying in dose between 9 Gy and 15 Gy. Local recurrence rates were very low in both groups: 1.59% in the HypoRT group and 2.44% in the ConvRT group. Rates of distant metastases were higher in the ConvRT group, with 3 out of 41 patients (7.32%) showing metastatic disease, compared to 3 out of 63 patients (4.76%) in the HypoRT group. The patients who recurred presented with metastases in the axilla, liver, bones and cerebellum. Log-rank tests and Kaplan–Meier analysis of data did not show any significant difference between ConvRT and HypoRT in terms of overall survival ($p = 0.402$), disease-free survival ($p = 0.751$), distant metastases free survival ($p = 0.851$) and loco-regional recurrence-free survival ($p = 0.244$).
Conclusions: Our data indicate that local control rates are comparable for HypoRT and ConvRT in patients with high grade breast cancer. Although confirmation of this data will require a higher number of patients and a longer follow-up, there is no evidence at this time that patients with high grade breast cancer are at a higher risk of recurrence after having received adjuvant HypoRT.

5127 POSTER

Three Fractions per Week Radiotherapy for Early Breast Cancer − Short-term Morbidity and Preliminary Outcomes

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Background: Over the last several years there has been renewed interest in hypofactionated adjuvant radiotherapy (RT) in breast cancer patients treated by conservative surgery in the light of radiobiological and clinical evidence. We present our experience regarding preliminary outcomes of a hypofractionated RT schedule.
Materials and Method: Between October 2007 and October 2009 80 women with early breast cancer were treated by 42.75 Gy/15 fractions over 5weeks. This treatment involved three fractions per week (Monday-Wednesday-Friday). All patients received an additional boost dose to the tumour bed of 8.55 Gy in 3 fractions using 6MV photons.
Acute radiation toxicity was the principal endpoint. Cosmetic appearance including changes in breast appearance together with breast shrinkage/hardness/swelling was also assessed. Methods of evaluation were photos (before and after the end of RT treatment at one/three/six month intervals), ultrasound examinations (before and after the end of RT treatment) and mammograms (three/six months and one year after RT).
Results: The median follow-up time was 24 months. In order to score radiation toxicity, patients were evaluated according the RTOG scoring system for radiation reactions at the end of treatment and 3, 6 and 12 months after treatment). At the end of RT RTOG grades 0, 1, 2 for acute skin toxicity were: 56/80 (70.0%), 19/80 (23.8%) and 5/80 (6.3%) respectively. After 3 months RTOG grades 0, 1, 2 were 64/80 (80%), 14/80 (17.5%) and 2/80 (2.5%). After 6 months RTOG grades 0, 1 were 72/80 (90.0%) and 8/80 (10.0%) respectively whereas after 1 year they were 78/80 (97.5%) and 2/80 (2.5%).
Breast shrinkage and breast hardness were the most common changes especially in patient with large breast volumes. An excellent to good cosmetic outcome (i.e. no change in breast appearance) was observed in 90% of patients.
There wasn't local or distant recurrence in any patient during this limited two years follow up.
Conclusions: Preliminary results (skin reactions and cosmetic appearance) from this study are consistent with published data that support the use of shorter fractionation schedules in early breast cancer patients after breast conservating surgery, in terms of cosmesis and effectiveness in local control. However a median follow-up of 2 years is too short to allow assessment of all the potential late normal tissue effects. This study is still on going to estimate late radiation morbidity for final evaluation.

5128 POSTER

Postmastectomy Radiotherapy Reduces Locoregional Recurrence and Overall Mortality for Breast Cancer Patients With T1−2 and One to Three Positive Lymph Nodes

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Background: The role of postmastectomy radiotherapy (PMRT) in breast cancer patients with T1−T2 tumours and one to three positive lymph nodes remains uncertain. This retrospective study was aimed to determine whether PMRT provides any clinical benefit in the study cohort of patients.
Material and Methods: We analyzed 174 post-mastectomy or post-lumpectomy women with pathologic T1−T2 breast carcinoma and 1 to 3 positive lymph nodes (LN) metastasis between 2000 and 2006. The 5-year Kaplan–Meier estimates of locoregional recurrence rate (LRR), distant recurrence rate (DRR) and overall (OS) were analyzed by age, histologic findings, surgery type, size of primary tumour (T), lymphovascular invasion (LVI), estrogen receptor (ER) status, numbers of positive LN, percentage of positive LN (cutoff level 25%), Her-2/neu status, adjuvant systemic therapy and irradiation. Multivariate analyses were performed using Cox proportional hazards modeling.
Results: The median follow-up was 58.5 months. The 5-year Kaplan–Meier LRR, DRR and OS were 8.3%, 15.2% and 88.9%, respectively. PMRT reduced 5-year LRR from 13.3% to 3.9% ($p = 0.036$). ER status, Her-2/neu status and LVI were significantly correlated with 5-year estimates of OS, whereas PMRT improved 5-year OS from 82.6% to 95.4% ($p = 0.039$) (Table 1). On multivariate analysis, PMRT was associated significantly with reduced LRR (hazard ratio [HR], 3.92; 95% confidence interval [CI], 1.07–14.43, $p = 0.04$) and improved OS (HR 2.82; 95% CI 1.09–7.30, $p = 0.033$).

Table 1. Multivariate analysis of Risk factors of LRR, DRR and OS

Factors	LRR		DRR		OS	
	p	HR (95% CI)	p	HR (95% CI)	p	HR (95% CI)
% of positive LN (⩾ 25% vs. <25%)	0.036	3.8 (1.09–13.28)				
ER status (Positive vs. negative)			0.027	0.42 (0.2–0.91)	0.006	0.3 (0.13–0.71)
HER2 status (Positive vs. negative)	0.016	4.16 (1.3–13.29)				
LVI (Negative vs. positive)					0.031	0.275 (0.09–0.89)
Adjuvant chemotherapy (Yes vs. no)			0.024	0.35 (0.14–0.87)		
PMRT (Yes vs. no)	0.04	0.26 (0.07–0.94)			0.033	0.36 (0.14–0.92)

Conclusions: For patients with T1−T2 and N1 stage breast cancer, PMRT reduced locoregional recurrence and showed overall survival benefit, especially in patients whose tumours were with positive of ER status, partial mastectomy, <25% positive LN and presence of LVI.

5129 POSTER

Evaluation of Delays in Adjuvant Radiotherapy Delivery Following the Introduction of a 23 Hour Model for Breast Surgery

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Background: Adjuvant radiotherapy (RT) prolongs disease free survival and overall survival in patients with operable breast tumours [1]. A delay of RT of more than 8−12 weeks after surgery adversely affects local recurrence [2]. In January 2010, our institution introduced a 23 hour model for breast surgery as part of a national programme to improve effectiveness and patient experience and to reduce length of stay [3]. This was implemented by careful patient selection and education, reduced use of post operative drains or discharge with drains in situ. In this study, we evaluate whether shorter inpatient stay for surgery delays adjuvant RT delivery due to a higher incidence of complications such as seroma or infection.
Materials and Methods: We performed a retrospective study of early breast cancer patients who underwent surgery and adjuvant external beam RT between December 2009-May 2010. Adjuvant chemotherapy patients were excluded. We evaluated time to RT from last surgery. Sources of any delay in this process were identified. Patients were stratified into two groups according to length of inpatient stay from initial surgery.
Results: 41 patients were evaluated. The mean age was 59.6 (range 37−78). 10 patients had a mastectomy and 31 had breast conserving surgery. 31 patients had T1 disease and 32 were staged as node negative. 3 patients had grade 1 tumours, 20 grade 2 and 12 grade 3. Histology was predominantly infiltrating ductal carcinoma. 3 patients had neoadjuvant chemotherapy. 16 patients had positive or close margins (<2 mm) after initial surgery. 8 of these had further surgery prior to RT. 88% of patients had positve Estrogen receptor (Alldred score >4) and 88% were HER2 receptor negative.
The average time from surgery to RT was 56 days. For patients with inpatient stays of one night or less ($n = 21$) this fell to 53 days. For those with longer inpatient stays ($n = 20$) the interval was 60 days. Delays to RT treatment were predominantly due to seroma and infection, but the incidence was equal in the short and long inpatient stay groups ($n = 2$ in each group).
Conclusions: In our limited study, the implementation of the 23 hour model has not impacted negatively on the timely delivery of adjuvant RT. Further