IGABT was based on MRI in 82% of the patients. Sixty percent were treated with high dose rate and the remaining 40% had pulsed dose rate BT. Eighty-four percent of the patients were treated with intracavitary (IC) technique. In the remaining 16% a combined IC and interstitial applicator was used.
Results: Total prescribed mean dose for HR-CTV (D90) was 89 ±15 Gy, D_{2cc} was 89 ±12 Gy for bladder, 64 ±8 Gy for rectum and 65 ±10 Gy for sigmoid. At a median follow-up of 31 (3-150) months, two patients had died due to morbidity (one fistula and one vaginal bleeding). No other G5 events were diagnosed. Actuarial morbidity G3-G5 at 5-years was 4% for UG tract, 6% for GI tract and 4% for VG. Actuarial morbidity G2-G5 at 5-years was 19% for UG tract, 18% for GI tract and 22% for VG.
Conclusions: In this retrospective multicentre study 3D conformal RT ± cisplatinum and IGABT compares favourble with previous studies on morbidity after 2D BT. These findings illustrate that the GEC-ESTRO guidelines work in a multicentre setting and serve as benchmark for future studies on IGABT for cervical cancer.

OC-0087
Correlation of dose with vaginal morbidity after MRI-guided brachytherapy for locally advanced cervical cancer
K. Kirchheiner[1], R.A. Nout[2], K. Tanderup[3], J. Lindegaard[3], A. Sturdza[1], P. Georg[1], C. Kirisits[1], W. Dörr[1], R. Pötter[1], C. Haie-Meder[4]
[1]*Medical University Vienna, Department of Radiotherapy, Vienna, Austria*
[2]*Leiden University Medical Center, Department of Clinical Oncology, Leiden, The Netherlands*
[3]*Aarhus University Hospital, Department of Oncology, Aarhus, Denmark*
[4]*Institut Gustave-Roussy, Department of Radiotherapy, Paris, France*

Purpose/Objective: To give a first interim report on prospectively assessed vaginal morbidity in the ongoing EMBRACE study (European and International study on MRI-guided brachytherapy in locally advanced cervical cancer, www.embracestudy.dk) and to describe a dose response relationship. Currently, no dose response relationship for vaginal morbidity has been established.
Materials and Methods: Patients with locally advanced cervical cancer who underwent combined external beam radiotherapy ± chemotherapy and MRI-guided brachytherapy following the GEC-ESTRO guidelines were included. Vaginal morbidity was prospectively assessed with CTCAE v.3 at baseline and every 3 months after end of treatment for the first 2 years. The assessment included vaginal dryness, mucositis, bleeding, stenosis, fistula and any other vaginal symptoms (reported in free text field). The dose to the ICRU rectal point was used as a surrogate for intermediate to high dose to the upper vagina in order to establish a dose effect relationship for vaginal morbidity with binary logistic regression analysis (dose response curves).
Results: Information on vaginal morbidity was available in 523 patients from 19 centers for analysis. Median follow-up was 14 months (286 patients with one year and 108 patients with 2 year follow-up). Crude incidences of individual vaginal symptoms are shown in table 1; no G5 morbidity occurred.

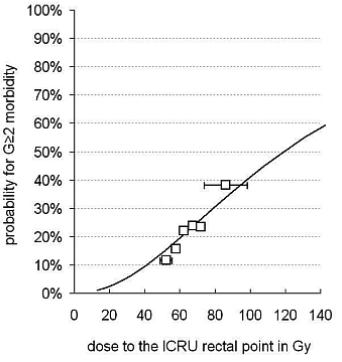
Table 1: Crude incidences of vaginal symptoms

N=523	Vaginal dryness	Vaginal stenosis	Vaginal mucositis	Vaginal bleeding	Vaginal fistula	Other vag. symptoms
G0	261 (50%)	205 (39%)	370 (70%)	356 (68%)	517 (99%)	461 (88%)
G1	230 (44%)	235 (45%)	129 (25%)	162 (31%)	2	43 (8%)
G2	32 (6%)	80 (15%)	21 (4%)	5 (1%)	0	15 (3%)
G3	NA	3 (1%)	3 (1%)	0	3*	3 (1%)
G4	NA	NA	0	0	1**	0

* 2 vesico-vaginal, 1 uretero-vaginal fistula
** 1 vesico/recto-vaginal fistula

Most frequent other vaginal symptoms were adhesions. Actuarial analyses resulted in 78% probability of any vaginal morbidity G≥1 and 19% G≥2 after 1 year, and 92% and 34% after 2 years. In 468 patients, information on vaginal morbidity and dose to the ICRU rectal point was available. In univariate logistic regression analysis, dose to the ICRU rectal point was associated with higher frequency of G≥2 vaginal morbidity (p= 0.002, figure 1).

Figure 1: Dose response curve: Increasing dose to the ICRU rectal point was associated with higher frequency of G≥2 vaginal morbidity (p= 0.002). Patients were grouped according to 5Gy intervals for better illustration; mean and standard deviation are shown.



Conclusions: Severe vaginal morbidity (G3/G4) is rare in the first two years after definitive radiochemotherapy including MRI-guided adaptive brachytherapy. However, the probability for milder to moderate morbidity (G1/G2) is high in the first year (78%) and further increases in the second year (92%). The ICRU rectal point dose correlates significantly with occurrence of G2≥2 vaginal morbidity. Further investigations with longer follow-up, including the relevance of confounding factors, are required. Additionally, analyses of individual vaginal endpoints and further dose parameters at the lower and middle vagina, especially also sensitive to external beam, are planned and will allow in future more detailed conclusions.

OC-0088
Salvage Re-irradiation using high dose rate brachytherapy in recurrent carcinoma of uterine cervix
N. Kalyani[1], U. Mahantshetty[1], R. Engineer[1], S. Chopra[1], S.V. Jamema[2], Y. Ghadi[2], D.D. Deshpande[2], S.K. Shrivastava[1]
[1]*TATA Memorial Hospital, Radiation Oncology, Mumbai, India*
[2]*TATA Memorial Hospital, Medical Physics, Mumbai, India*

Purpose/Objective: The purpose of this study was to determine feasibility of salvage re-irradiation with high dose rate (HDR) brachytherapy and patterns of failures in previously irradiated patients diagnosed with recurrent carcinoma of the uterine cervix.
Materials and Methods: Twenty-eight previously irradiated patients presenting with central recurrence with / without early parametrial disease and deemed not suitable for exenteration surgery by Gynec oncologist, were treated with salvage re-irradiation using HDR brachytherapy at our institute. All these patients underwent imaging (CT / MR/ PET-CT) to rule out metastatic disease elsewhere in the body. Martinez Universal Perineal Interstitial Template (MUPIT) was used in 24 patients while Vienna applicator in 4 patients. Median age for the cohort was 54 years (range 38-73 years). Median interval between two radiation schedules was 25 months (inter-quartile range 13-49 months). Median delivered dose was 40.3 Gy EQD2 (inter-quartile range 36.9 - 46.6 Gy). None of the patients received any form of Chemotherapy (concomitant / adjuvant /salvage).
Results: All patients tolerated salvage re-irradiation with HDR brachytherapy well. None of the patients reported any significant acute toxicity. The median follow up for whole group was 16 months (inter-quartile range 7-20 months). Complete response was seen in 21 patients, partial response in 6 patients and progressive disease in one patient on clinic-radiological assessment. At last follow up 15 patients were alive, of which 13 were diseases free. Ten patients developed central recurrence (biopsy proven), 3 patients had loco-regional recurrence while 2 patients had distant metastases. Overall, 13/28patients developed local recurrence. The local recurrence rate was higher inpatients receiving doses less than 40 Gy EQD2.The median disease free survival(DFS) and overall survival (OS) was 16 and 20 months respectively. Two year DFS and OS were 33% and 44% respectively. Median DFS was more for patients with more than 25 month interval between two RT schedules, while tumour size and RT dose had no impact on overall DFS. Two patients developed grade III radiation proctitis, 3 patients had grade II radiation cystitis and 2 patients developed grade II bowel complications after re-irradiation. One patient required hyperbaric oxygen therapy for chronic non-healing ulcer at vagina.
Conclusions: Salvage re-irradiation using HDR brachytherapy is feasible in select group of patients with central recurrence. The

outcome is comparable with pelvic exenteration surgery and it is better with longer interval between two radiation schedules. However, larger series and longer follow-up of clinical outcome and late toxicities is required for further validation of current promising results.

OC-0089

Reirradiation in recurrent cervical and vaginal cancer: analysis of effectiveness and toxicity.

A. Zolciak-Siwinska[1], M. Dabkowski[1], M. Bijok[2], M. Kawczynska[2], W. Michalski[3], A. Kulik[1]
[1]*The Maria Sklodowska-Curie Memorial Cancer Center, Department of Brachytherapy, Warsaw, Poland*
[2]*The Maria Sklodowska-Curie Memorial Cancer Center, Medical Physics Department, Warsaw, Poland*
[3]*The Maria Sklodowska-Curie Memorial Cancer Center, Biostatistics Department, Warsaw, Poland*

Purpose/Objective: The aim of this retrospective study was to investigate treatment results and toxicity profile of reirradiation treatment in inoperable patients with first local recurrence of cervical or vaginal cancer. Additional analysis of clinical and dosimetric parameters was undertaken in order to define prognostic factor in this cohort.

Materials and Methods: Between 1997 and 2011, 20 patients have been treated at Brachytherapy Department in Warsaw for recurrent cervical (19) or vaginal (1) cancer. All patients were deemed inoperable or refused surgery. Median age of patients was 62 years (range 26-77). Three patients had adenocarcinoma, 16 - squamous cell carcinoma and one- carcinoma solidum undifferentiatum. Three patients were treated with combined EBRT and brachytherapy. In 9 patients brachytherapy was associated with hyperthermia treatment. The main technique used in brachytherapy applications was interstitial (11 patients), followed by vaginal cylinder (6) or intraoperative (3). The median EQD2 dose calculated for reirradiation treatment was 48,8Gy (range 25-91), and median cumulative EQD2 dose calculated for primary and reirratiation treatment was 133,5Gy (range 96,8-164,2). Early and late toxicity was scored with RTOG and RTOG/EORTC scales respectively. Kaplan-Meier estimates for overall survival(OS), disease free survival (DFS) and loco-reginal control (LC) were calculated. Mantel-Cox's method was used to define the influence of clinical and dosimetric parameters on OS, DFS, LC and toxicity profile.

Results: The 3-year OS (95%CI) was 68% (44%-91%). The 2-year DFS (95% CI) was 42.1% (19.4%-64.8%). The 2-year LC (95% CI) was 45.1% (21.6%-68.6%). According to Mantel-Cox's analysis, the time to first local failure ≤12 months and tumour diameter > 3cm were both adverse prognostic factors affecting OS (p=0.001, 0,001 respectively), DFS (p=0.014,0,013 respectively) and LC (p=0.007, 0,005 respectively). Acute toxicity was acceptable, with no grade 3-4 radiation related toxic effects reported. GU and GI grade 3 late toxicity was observed in 2 patients (10%) and 1 patient (5%) respectively.

Conclusions: Reirradiation with the use of high quality brachytherapy is a treatment option in recurrent cervical and vaginal cancers with potential for permanent cure. Low level of severe late complications encourages total dose escalationin order to increase the chance of cure. According to the results of this analysis patients with local recurrence diagnosed during the first year of follow up or tumour diameter > 3cm should not be treated with radiotherapy again.

POSTER DISCUSSION: 3: CLINICAL: HEAD& NECK/ LUNG

PD-0090

Altered fractionation radiotherapy for elderly patients with locally advanced head and neck cancer

S. Huang[1], O. Espin-Garcia[2], W. Xu[2], J. Waldron[3], J. Kim[3], J. Ringash[3], J. Cho[3], A. Bayley[3], A. Hope[3], B. O'Sullivan[3]
[1]*Princess Margaret Hospital/University of Toronto, Radiation Therapy, Toronto Ontario, Canada*
[2]*Princess Margaret Hospital, Biostatistics, Toronto Ontario, Canada*
[3]*Princess Margaret Hospital/University of Toronto, Radiation Oncology, Toronto Ontario, Canada*

Purpose/Objective: Chemoradiotherapy is the standard of care for locally advanced head and neck cancer (LAHNC). However, many elderly patients are unsuitable for this approach. We report our experience of altered fractionated radiotherapy (RT) as a potential means of treatment intensification for this population.

Materials and Methods: A retrospective review was conducted on a prospectively assembled cohort of all newly diagnosed LAHNC (stage III-IV) in elderly patients (> 70 years old at the diagnosis) treated with RT alone in our institution between 1/1/2003 ~ 4/30/2010. RT regimens were not randomly assigned and were classified into 3 categories: a) standard RT (sRT) [70 Gy in 35 fractions over 7 weeks (70 Gy/35f/7w)], b) moderated accelerated RT (mRT) over 5 or 6 weeks (60 Gy/25f/5w, or 70 Gy/35f/6w), and c) very accelerated RT (vRT) over 4 weeks (64 Gy/40f/4w, twice daily). Appropriate supportive measures were provided during and after RT. Selective use of vRT was primarily in patients with good performance status but with bulky tumors. Overall survival (OS), locoregional control (LRC), distant control (DC), and actuarial late toxicity (>=Grade 3 by EORTC/RTOG criteria) were calculated and compared among the sRT, mRT and vRT cohorts. Multivariate analysis (MVA) identified predictors for OS and LRC.

Results: A total of 294 patients were included (48 sRT, 178 mRT and 68 vRT). Disease sites were: oropharynx (113, HPV positive 38, negative 32, unascertained 43), larynx (93), oral cavity (33), unknown primary (23), hypopharynx (25), and nasal cavity (7). Six patients (2 sRT and 4 mRT) did not finish the RT and 77 patients (14 sRT, 46 mRT, 17 vRT) had unplanned breaks during RT. The vRT patients were younger (median age: vRT 74.9, sRT 75.2, mRT 76.5 years, p<0.01). Smoking pack-years and the proportions of oropharyngeal cancer, T4 and N2b-N3 category disease were similar among the 3 cohorts. Of the 183 deaths, 24/35 (69%) sRT, 64/107 (60%) mRT, and 22/41 (53%) vRT cases died of their index cancer. 3-year outcomes for the 3 cohorts are listed in table 1. MVA revealed mRT was associated with better OS (HR 0.62, p=0.02) and LRC (HR 0.49, p<0.01) vs sRT, while vRT was also associated with better OS (HR 0.49, p<0.01) and marginally improved LRC vs sRT (HR 0.66, p=0.19) when controlling for T- & N-category, age, smoking pack-years, and disease site.

Table 1. 3-year Outcomes of Patients Treated with Various Radiotherapy Regimens

3-year Outcome % (95% CI)	Overall Survival	Loco-regional Control	Distant Control	Late Toxicity
sRT	32 (21-50)	53 (36-66)	87 (72-94)	24 (12-47)
mRT	44 (37-53)	71 (64-77)	84 (78-89)	16 (10-24)
vRT	54 (43-68)	64 (51-74)	82 (70-89)	19 (11-32)
p-value	0.055	0.041	0.945	0.641
Multivariate Analysis:				
mRT vs. sRT	0.62 (0.42-0.92)	0.49 (0.28-0.84)	N/A	N/A
p-value	0.018	0.009		
vRT vs sRT	0.49 (0.30-0.80)	0.66 (0.36-1.22)		
p-value	0.004	0.190		

Abbreviations: sRT: standard radiotherapy; mRT: moderated accelerated radiotherapy; vRT: very accelerated radiotherapy; 95% CI: 95% confidence interval

Conclusions: This non-randomized assigned cohort study demonstrates an association between altered fractionation RT schedules and outcome in elderly patients with LAHNC, without significantly increased late toxicity. The benefit of vRT is uncertain, since the observations are likely confounded by selection bias (bulkier tumor on the one hand and younger fitter patients on the other) and small sample size. With appropriate patient selection, altered fractionation RT is a valid treatment intensification option for the older population in the setting of appropriate supportive management during and following RT.

PD-0091

Plasma EBV DNA assay in post-treatment remission nasopharyngeal cancer patients- a prospective multi-center study

Y.C. Liu[1], S.W. Leung[2], H.W. Chen[3], C.J. Huang[4], L.L. Ting[5], J.C. Lin[1]
[1]*Taichung Veterans General Hospital, Radiation Oncology Department, Taichung, Taiwan*
[2]*Yuan's General Hospital, Radiation Oncology Department, Kaohsiung, Taiwan*
[3]*National Cheng-Kung University Hospital, Radiation Oncology Department, Tainan, Taiwan*
[4]*Kaohsiung Medical University Hospital, Radiation Oncology Department, Kaohsiung, Taiwan*
[5]*Taipei Medical University Hospital, Radiation Oncology Department, Taipei, Taiwan*

Purpose/Objective: To investigate the clinical value of the plasma EBV DNA (pEBV DNA) assay in patients with nasopharyngeal carcinoma (NPC) after curative treatment.