Stereotactic Body Radiotherapy and Hypofractionated Radiotherapy for the Treatment of Gynecological Malignancies

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Purpose/Objective

Gynecological malignancies are traditionally treated with a combination of EBRT and brachytherapy. In certain situations however, brachytherapy may not be technically feasible or not advisable due to medical comorbidities. Management of isolated nodal recurrences, especially para-aortic, also presents a challenging dilemma. Technologic advances in planning now enable the delivery of ablative tumor doses with relative sparing of adjacent normal tissues.

The specific aim of the present analysis was to assess local control and acute toxicity in patients with gynecological malignancies treated with either stereotactic body radiotherapy (SBRT) or hypofractionated radiotherapy (HFxRT).

Materials/Methods

Between 05/2009 and 02/2011, 17 infra-diaphragmatic sites in 14 patients were treated with either SBRT (n=8) or HFxRT (n=9). Four patients were treated with definitive SBRT in lieu of a brachytherapy boost.

Table 1. Individual Patient Clinical Characteristics and Treatment Plan Data

Patient	Age	Hist.	Site	Dose / Fx x # Fx	GTV volume (cm3)	PTV volume (cm3)	Mean Dose to GTV (cGy)	Mean Dose to PTV (cGy)	Max Dose (cGy)
1	72	Endo AC	Brachy boost	520 x 4	295.3	634	2797.6	2480.1	3131.6
2	60	Endo AC	Brachy boost	600 x 5	24.1	108.3	3143.6	2848	3265.8
3	31	Cerv AC	Brachy boost	500 x 4	33.5	33.5	2193	2193	2428.3
4	87	Endo AC	Brachy boost	500 x 4	131.3	131.3	2100.2	2100.2	2273.1
5	64	Ov GCT	Hepato-renal	250 x 18	255.3	510.2	5371.3	5003.2	6136.3
6	64	Ov PS	R. PA	250 x 15	8.6	57.9	3809.7	3811	3877.4
6	64	Ov PS	R. sidewall	250 x 15	135.9	202.1	4035.9	4307.4	4999.5
6	64	Ov PS	R. PA & L. CI	250 x 15	593.3	806.25	4255.9	4167.4	4969.2
6	65	Ov PS	L. PA & R. CI	250 x 15	800.9	1310.6	3973.1	3946.8	4343.2
7	72	Vag SCCA	L pre-sacral	250 x 15	132.5	262.6	4339.8	4127.4	5620.5
8	34	Cerv SCCA	PA	250 x 15	108.5	108.5	3977.7	3977.7	4485.2
9	45	Endo AC	Infra-panc	250 x 15	11.77	31.45	4112	4010.7	4152.6
10	58	Ov PS	L. CI	600 x 5	9.4	37.05	3627.6	3394.4	3717.7
11	60	Cerv SCCA	L. pre-sacral	250 x 15	189.2	300.8	4581.9	4361.4	4911.1
12	61	Endo AC	L. Vag cuff	650 x 5	51.6	98.1	4792.8	4204.9	4292.8
13	52	Cerv AC	Vag cuff	500 x 4	32.73	42.39	2229.8	2200.5	2351.8
14	62	Endo AC	L. sidewall	600 x 5	58.6	58.6	3373	3373	3645.7

Results

For definitive SBRT, mean Rx dose was 22.7Gy in 4-5 fx, mean GTV volume was 121.1cm^3, and mean PTV volume was 226.8 cm^3. Mean dose to GTV and PTV was 25.6Gy and 24.1Gy, respectively.

For isolated pelvic, nodal, and sidewall recurrences, the most common dose/fractionation was 37.5Gy in 15 fx. Mean GTV dose was 40.6Gy; mean PTV dose was 38.9Gy.

Median FU was 7.6m. Local control was achieved in 12 of 14 patients, though 21.4% did have distant progression. The most common acute toxicities were diarrhea (52.9%), nausea (23.5%), and urinary urgency/frequency (11.8%), which resolved by the time of 1st follow-up in all but 2 patients.

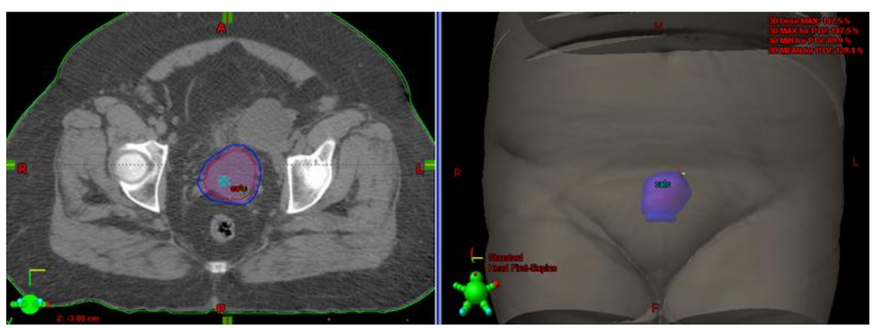
Table 2. Acute Toxic Effects of SBRT and HFxRT (# patients)

Toxicity Category	Grade 1	Grade 2	Grade 3-4
Nausea	2	2	0
Diarrhea	7	2	0
Urinary frequency/ urgency	2	0	0
Small bowel obstruction	0	1	0
Vaginal bleeding	0	1	0

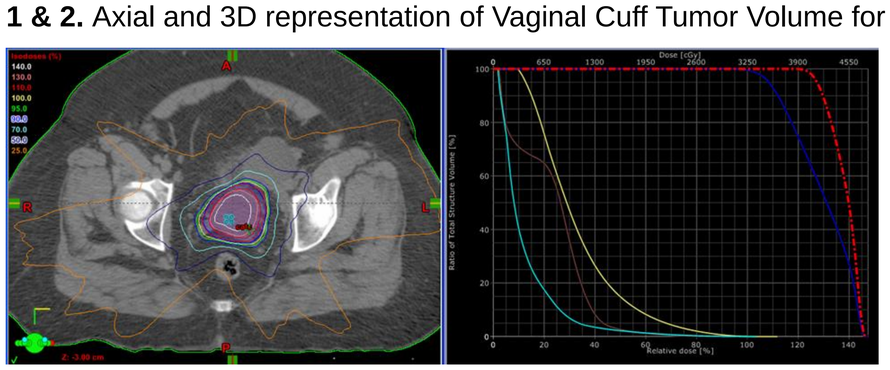
Table 3. Planning Parameters for 5 fraction SBRT

PTV=GTV + 0-5mm margin	Normalized to V100%=95%	MaxDose~130% of PD
OAR	Point Max*	Volume Max*
Bladder	7.6Gy x 5 = 38	3.65Gy x 5 = 18.3 to <15cc
Rectum	7.6Gy x 5 = 38	5Gy x 5 = 25 to <20cc
Small Bowel	7Gy x 5 = 35	3.9Gy x 5 = 19.5 to <5cc

***** Timmerman, Seminars in Radiation Oncology 2008, 18(4), 215.



Figures 1 & 2. Axial and 3D representation of Vaginal Cuff Tumor Volume for SBRT



Figures 3 & 4. Isodose lines and DVH for Vaginal Cuff SBRT

Conclusion

Treatment of gynecological malignancies, both in the definitive and recurrent setting, with either SBRT or HFxRT has yielded encouraging preliminary local control outcomes with minimal toxicity. Longer follow-up is needed to assess for long- term local control and late toxicity.

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