HOSPITAL CENTRAL DE LA DEFENSA "GÓMEZ ULLA"

Adrenal SBRT treatments using ExaCradle dampening system

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INTRODUCTION AND AIM

Adrenal glands are common location for methasthases from different primary disease sites. Detection of such lesions has increased due to improvements in the quality of diagnostic techniques, including image. Traditinal treatments for adrenal methastasis have been usually carried out by means of some of the following alternatives: adrenalectomy, chemotherapy or radiofrequency. Recent developments in external radiation therapy, specifically the delivery of high doses by means of stereotactic body (SBRT) techniques have made possible to treat these disease locations in a effective way. The present study shows the location and dosimetric results in the treatment of adrenal locations combining volumetric treatments (VMAT) and breathing-related motion control by means of a dampening system.

METHOD

exaCradle is a multi-dampening system than can combine eight different compression points. This device allows to adapt the immobilization for each patient and site in SBRT treatments. Data for five patiens with adrenal lesions have been gathered, with three compression points: anterior, anterior-oblique and lateral. 4 CT datasets were acquired for each patient (free breathing, maximum inspiration and expiration breathold and ultra-slow CT acquisition by means of cone beam CT (CBCT) imaging in the treatment unit). All image sets were registered in order to generate the ITV by combining the CTVs contoured for each dataset. PTV was defined as a 5 mm expansion from ITV. Treatments were planned with Monaco 5.1 (Elekta) and delivered with a Synergy (Elekta) linac by means of VMAT techniques. For each fraction, 3 or 4 CBCT scans were performed: pre-treatment (inter-fraction correction, repeated when corrections exceed ITV-PTV margin), mid-treatment (intra-fraction correction) and post-treatment (final evaluation).

RESULTS

Treatment Delivery parameters (MU, number of segments, number of arcs), dose-volume parameters (D95 (Gy), V107(%) for target volumes and Dmax (Gy), Dmean(Gy) for OARs) and location parameters (pre-, mid- and posttreatment deviations) are shown in the Table. Except one patient, in which target volume coverage went down due to dose constraint in OARs (small bowel), dose-volume parameters acomplished the goals. Mean deviations for location were compatible with ITV-PTV margin.

Delivery parameters	Parameters	Patient # 1		Patient # 2		Patient # 3		Patient # 4	
	MU	2108.3		2011.6		3423.1		1491.2	
	Segments	303		324		116		162	
	Arcs	2		2		1		2	
Dose-volume parameters	Target volumes	D95 (Gy)	V107 (%)	D95 (Gy)	V107 (%)	D95 (Gy)	V107 (%)	D95 (Gy)	V107 (%)
	ITV	38.7	11.1	38.6	4.3	33.1	16.4	38.0	0.9
	PTV	35.6	5.0	35.6	10.0	28.1	10.8	38.2	0.4
	OARs	Dmax	Dmean	Dmax	Dmean	Dmax	Dmean	Dmax	Dmean
	Aorta	24.4	7.7	36.2	12.5	42.3	4.9	20.2	6.5
	Cava	38.8	14.5	-	-	-	-	31.4	16.4
	Renal cortex	34.7	9	22.1	3.6	41.6	9.3	39.0	4.5
	Renal hilium	24.4	5.4	39.5	9.3	-	-	-	-
	Liver	39.5	4.7	11.9	1.0	34.0	3.7	41.4	9.9
	Stomach	9.6	3.6	20.4	7.6	32.1	3.2	17.5	5.0
	S bowel	1.8	1.0	32.3	4.2	31.7	1.0	1.2	0.4
	L bowel	11.6	2.8	13	5.2	32.4	1.6	5.9	1.2
	Heart	5.3	0.8	-	-	0.8	0.2	1.8	0.4
	Spleen	11.6	4.5	-	-	35.1	6.4	-	-
	Cord	10.6	2.4	15.2	4.1	12.2	1.8	12.5	1.8
Location parameters	Xpret (mm)	-3.1 ± 4.1		-2.6 ± 3.1		-1.2 ± 2.1		-1.5 ± 3.1	
	Ypret (mm)	-0.7 ± 4.2		-0.4 ± 1.9		5.7 ± 6.0		-3.1 ± 3.6	
	Zpret (mm)	-1.1 ± 4.1		6.8 ± 1.9		5.8 ± 1.5		1.7 ± 2.0	
	Xmid (mm)	0.0 ± 1.1		0.1 ± 0.4		-2.7 ± 2.7		0.4 ± 1.9	
	Ymid (mm)	0.5 ± 0.7		0.0 ± 0.3		-2.4 ± 6.2		0.1 ± 0.9	
	Zmid (mm)	-0.6 ± 0.6		0.4 ± 0.4		-0.6 ± 3.8		0.0 ± 0.5	
	Xpost (mm)	0.0 ± 0.4		0.5 ± 0.1		-1.8 ± 0.6		0.9 ± 1.4	
	Ypost (mm)	0.1 ± 0.9		0.0 ± 0.4		1.6 ± 0.8		-1.0 ± 1.1	
	Zpost (mm)	-0.2 ± 1.0		0.4 ± 0.4		-0.3 ± 0.5		-0.7 ± 0.2	

Table: Delivery, dose-volume, and location parameters

CONCLUSIONS

Immobilization provided by the studied device, together with VMAT and IGRT techniques allowed to deliver treatments for adrenal locations in a safe and effective way.

CONTACT INFORMATION

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