Initial Dosimetric Experience with the Contura™ Multi–lumen Radiation Balloon Applicator

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Purpose/Objectives

We present our initial experience with the Contura™ Multi–lumen Radiation Balloon Applicator (SenoRx) with an emphasis on dosimetric comparison between the Contura™ and treatment using a single dwell position in a single–lumen balloon.

Materials/Methods

We have treated ten patients with the Contura™. Seven of these were planned using the Inverse Planning with Simulated Annealing (IPSA) module in the Plato Brachytherapy Planning System (Nucletron). Reasons for using IPSA included

(1) dose reduction to nearby organs at risk (i.e., skin, ribs)

(2) increasing irradiated volume to cover at–risk tissue that had been displaced by air or seroma while maintaining acceptable high–dose volumes (V150, V200).

For each IPSA case, an additional plan was generated for comparison using a single dwell position in the central lumen, simulating a conventional treatment with a single–lumen balloon. The treatment time used for this comparison plan was chosen so as to produce the same prescription dose coverage (V100) of the planning target volume (PTV) as the clinically–used plan.

Results

A comparison of various dosimetric parameters is presented in Table 1. Figure 1 shows comparative isodose distributions for one patient in which the balloon–to–skin distance was 3 mm. Figure 2 shows a case where the Contura's vacuum port was used to reduce the volume of air around the balloon and the prescription dose pushed towards the remaining air pocket to increase target coverage.

Conclusions

The multi–lumen design of the Contura™ offers added flexibility in treatment planning. A particular benefit is the ability to treat patients unable to meet dosimetric requirements using a single–lumen applicator.

TABLE 1. Comparison of dosimetric parameters. Bold values fail requirements set forth in the NSABP B–39 and Contura registry trial protocols (i.e., V200 < 10 cc, skin/rib max. dose < 145%).

Patient	V100 (%)	V200 (cc)		OAR max dose (%)	
		1 dwell	IPSA	1 dwell	IPSA
1	94	8	7	**195**	135
2	98	9	8	**177**	139
3	91	4	6	**209**	144
4	95	6	7	**183**	134
5	94	7	7	**173**	135
6	98	**12**	9	123	129
7	94	9	7	**167**	138

FIGURE 1. Isodose comparison between a single–dwell and a multi–catheter / dwell plan. The miminum balloon–to–skin distance is 3 mm. The PTV is shown in purple. Using multiple catheters and dwell positions reduces the maximum skin dose from 195% to 135%. (Per the NSABP B–39 protocol, the maximum allowable skin dose is 145%.) We note that using IPSA to optimize multiple dwells activated in only a single catheter resulted in a maximum skin dose of 155%.

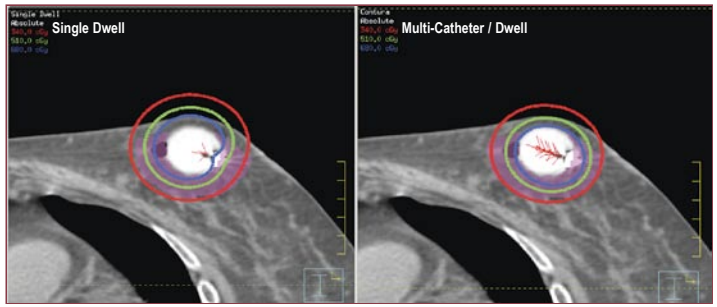

FIGURE 2. The upper left image shows an initial CT acquisition. The air pockets occupy 8% of the PTV. The upper right image shows a CT acquired after use of the Contura's vacuum port. Air now occupies only 4% of the PTV. The lower left image shows an initial plan, with dose prescribed to 1 cm from the balloon (shown in tan). The lower right image shows a modified plan, in which the dose has been pushed 2–3 mm in the direction of the remaining air pocket.