Cardiac Sparing Whole Lung (WL)-IMRT Study Simulation/Planning Tips

March 12, 2012

We appreciate your interest in participating in this study. Please note that we require at least 3 business days for review of your treatment plan once it is submitted to QARC and we have verified that all of the required data is received for the pre-treatment review.

Dr. Kalapurakal and Dr. Rigsby have provided additional treatment planning information and guidelines for using contrast with CT simulation for this study, Cardiac Sparing Whole Lung IMRT in Children and Young Adults with Lung Metatases protocol.

The protocol guidelines are pretty straightforward. Please refer to the specifics regarding patient positioning, CT scan sequence with and without contrast/bellows, contouring. You could use whole heart contours for physics dose volume constraints. As far as specific cardiac volumes such as different heart chambers, myocardium, coronaries etc - you could refer to the QARC website. Dr. Rigsby the study radiologist will redo these contours even if you cannot do them all - so don't worry about these. Please refer to notes below regarding some pointers for contouring, planning, total heart DVHs etc. Do not hesitate to contact Dr. Kalapurakal, if you have additional questions. Advise patients that the planning will take 1 – 2 weeks and plan the treatment start accordingly.

Additional pointers for treatment planning:

After review of the first few cases, there are some concerns that the PTV constraint listed in the protocol may not guarantee the full coverage expected for the total lung volume. In order to be certain that the lung volume is well covered, an additional structure is suggested to assist you with your planning. The additional structure is defined as the clinical target volume of the Maximum Lung Expansion (MLE-CTV) which will be the MLE on four dimensional scans plus 0.5cm expansion all around. (The mediastinum and vertebral bodies should not be included in this structure.) We recommend that the V95 (Volume receiving 95% of the prescribed dose) = 99-100% of this new MLE-CTV structure. If through expansion, the CTV or PTV goes beyond the external contour, care should be taken to keep CTV and PTV at least 3mm inside external skin contour. All other parameters should be per protocol.

1) Please put the bellows around the epigastrium area for maximal lung expansion, get good respiratory cycle tracing before you start the 4D scan. No bellows should be used on the initial scan.

2) Please complete the dosimetry part of the study too – please use the 3D and not 4D lung volume for the AP-PA plans as we are attempting to compare the new and old techniques. The uncorrected plan should be done first, followed by the heterogeneity corrected plan with the same monitor units of the uncorrected plan.

3) Be sure to get CT cuts from the mandible down and up to the pelvis - so that we have DVHs for the entire thyroid, liver etc.

> 3A) Please keep jaw extended on a neck rest to avoid mandibular radiation, not sure if needs aquaplast mask..depends on the case.
>
> 3B) Please follow the sequence of non-contrast scan FOLLOWED BY contrast scan as detailed in the protocol because we would like NOT TO introduce contrast density into the IMRT plan. PLEASE NOTE THAT THE GATED SCAN IS THE SECOND SCAN WITH CONTRAST AND BELLOWS...DO NOT PUT ANY BELLOWS ON THE INITIAL NON CONTRAST SCAN...

4) If you have the bellows placed in the epigastrium, periumbilical area you will get good respiratory wave forms for the gated CT scan.

5) If the child is cooperative you could go for the arms up position - but otherwise arms down and away from the body as the child may not be able to hold the arms in the "up" position for the duration of treatment. Arms should be contoured and designated as avoidance structures to reduce the dose as much as possible to the arms...

6) Fusion of the two scans will help immensely with outlining of the cardiac chambers, myocardium etc..you could try to draw the coronaries etc based on our atlas at the QARC website..But you don't have to worry - Cindy Rigsby will edit all of these contours during central imaging review so that the actual DVHs etc will be based off of her contours. Submission of the MinIP of the 4D CT is required at the time of the interventional review for registration with the treatment planning CT.

7) Treatment planning reports for all three plans should be submitted at the time of the interventional review, as well as the Motion Management Form.

Guidelines for using contrast with the CT simulation:

The following regimen was provided by Dr. Cynthia Rigsby in preparation of using contrast with the CTsim to delineate the cardiac chambers for your patients enrolled on the Cardiac Sparing whole lung IMRT protocol. Please distribute this to the staff in your respective departments who will need this information.

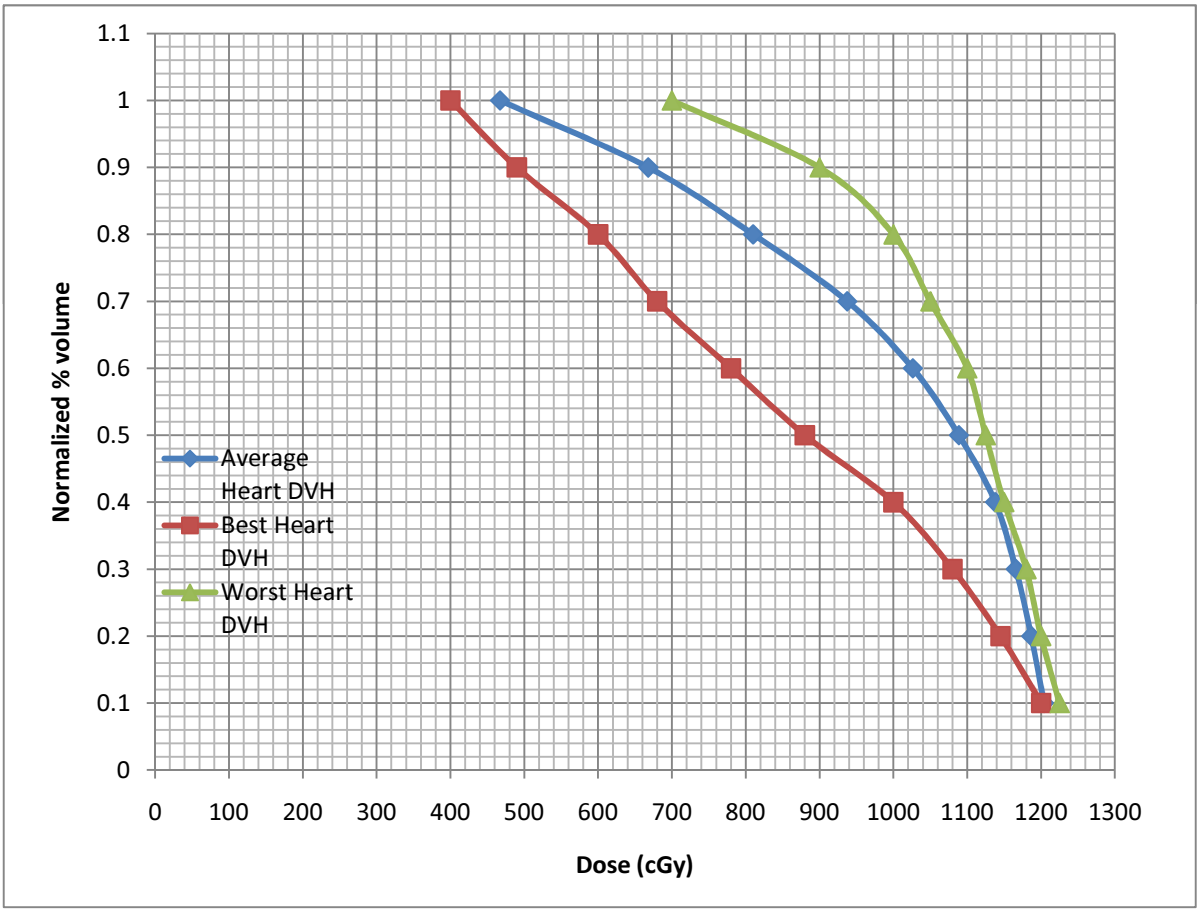
Use 1.5 ml/kg max 125 cc (OPtiray 320) contrast with a standard injection rate of 2 ml/sec.

For a standard chest only exam on our 64 slice scanner, delay 25 sec and then scan.

If scanning C, A, P, delay 50 sec and then scan.

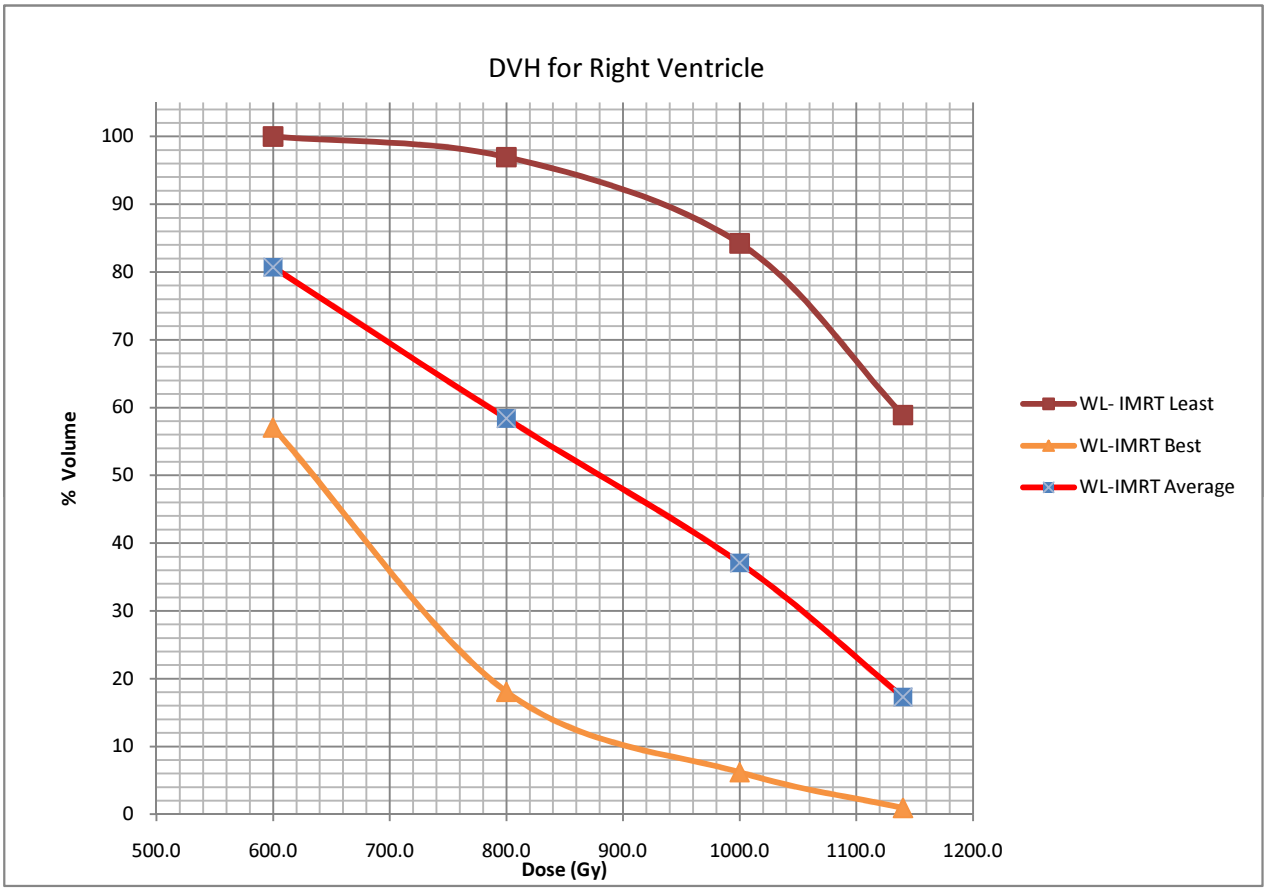
Heart DVH

Heart norm.% vol	Average	Best	Least
	dose in cGy		
1	467	400	700
0.9	668	490	900
0.8	810	600	1000
0.7	938	680	1050
0.6	1026	780	1100
0.5	1089	880	1125
0.4	1138	1000	1150
0.3	1166	1080	1180
0.2	1187	1145	1200
0.1	1204	1200	1225



Right Ventricle DVH

Dose	Least	Average	Best
(cGy)	Volume (cc)		
600	100	80.7	57.1
800	96.9	58.4	18.1
1000	84.2	37.1	6.2
1140	58.9	17.3	0.9



Left Ventricle DVH

Dose	Least	Average	Best
(cGy)	Volume (cc)		
600	100	95.2	82.1
800	97.8	83.5	60.6
1000	86.4	64.8	38.6
1140	60.2	38.0	18.7