3 - 66   Development of Heavy Ion Treatment Planning System at IMP

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Treatment planning system (TPS) plays an important role in radiotherapy. For heavy ion radiotherapy, the mode of beam delivery and the model of relative biological effectiveness (RBE) are involved in a TPS. A preliminary heavy ion TPS used for passive beam shaping has been developed and applied to the clinical trial at IMP. However, the TPS of this earlier version is unable to meet the needs of the dedicated heavy ion therapy facilities being under construction in Lanzhou and Wuwei, China. So a function complete TPS applicable to both passive and active beam delivery methods is considered to be urgent. Towards this goal, a complete new heavy-ion TPS based on our experience before is being developed at IMP.
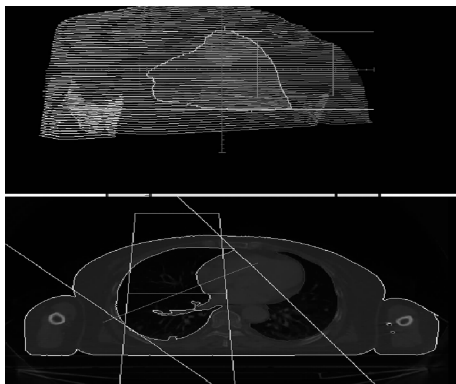

Fig. 1 An example to show the field setup module of heavy ion TPS which is under development.

Fig. 2 A DRR image in the beam's eye view derived from the ray-tracing algorithm used in heavy ion TPS.

The new TPS was developed in a manner of various modules such as patient data management, CT image preprocess, target/organ delineation, field setup, dose calculation and plan evaluation. Data exchange among the different modules were realized through data interfaces, and the module were incorporated into a whole software system under a common graphical user interface (GUI). In the module of CT image preprocess, patient positioning markers in the serial CT images are searched so that the mapping point of the isocenter at the treatment position in the body is defined. The offsets between the isocenter and the center of the target volume, determined in the target/rogan delineation module, in the three dimensions make the patient positioning possible. Pencil beam dose algorithm is used in the dose calculation module and patient bolus is able to be computed once the mode of passive beam delivery is selected. Fig. 1 shows an example of the field setup for a patient, where two intersecting fields were set. For accurate positioning, digitally reconstructed radiography (DRR) can be conducted in the field setup module as well. Fig. 2 exhibits a DRR image under the beam's eye view (BEV) derived from the ray-tracing algorithm. Up to now, Most of the functional modules have been implemented and the completion of the heavy-ion TPS development is expected in 2013.