Accuracy and Time Considerations in Intensity Modulation Treatment Planning

The process of converting intensity modulation patterns into a sequence of leaf positions is a key step in IMRT. Both the accuracy (errors arise from leakage and scatter) and the speed of the treatment are affected by the combinations of choices for segmentation algorithms, correction options (tongue and groove, match line, single aperture, fluence), and various settings which affect the segmentation process. Hence, using only one leaf sequencing algorithm can be limiting. IMFAST™ is a product that gives the user various algorithms and correction options for leaf sequencing on the Siemens MLC. The results for different settings in the software for a very complex intensity map will be presented. These results lead to the following rules of thumb for IMRT treatment planning: 1) choose treatment ports with minimal critical structure involvement, 2) the number of ports times the number of levels per port should be no more than 60, and 3) choose segmentation algorithms that decouple segment error contributions (slice, platform, optimal platform). Using these guidelines will reduce treatment time and improve delivery accuracy. For those cases that are an exception to the rule, one needs to explore the various algorithms to produce a clinically useful leaf sequence. One such case will be presented. Siemens Medical Systems supported this research.