

The purpose of this presentation is to discuss issues in IMRT treatments for head and neck cancers. The main focus will be on the details related to the planning process such as, immobilization, imaging and setup management, treatment planning, and plan evaluation. The conformal nature of IMRT dose distributions requires additional consideration on the degree of immobilization and expected reproducibility of setup. Custom neck molds, masking systems and additional shoulder constraints are required to maximize reproducibility of the head, chin, and clavicals (supraclavicular nodes). Even with these constraints, daily variability can be expected and the treatment plan should account for those effects. Localization tools such as on-board kV planar imaging and cone-beam CT can be used daily to aid in localization and patient set-up. Target and normal tissue segmentation are very important in the planning process and must be considered in detail by the physicist. Various imaging modalities are frequently used. Contrast enhanced CT and MRI-CT fusion is helpful for primary tumor segmentation. Fused <sup>18</sup>F<sub>2</sub>FDG PET-CT images can be used to identify positive neck nodes but lack anatomic definition and are not always useful for defining the primary tumor. Before treatment planning begins, a dialogue with the physician can reduce the number of IMRT plans that are attempted to arrive at the best plan. The conversation with the physician should contain information about dose/volume tolerances of normal tissues and other patient-specific issues (e.g., previous treatment, chemotherapy, or already compromised tissues). With IMRT treatment planning there are many more techniques at the physicist's disposal to develop the best treatment plan compared to conventional planning. Evaluating IMRT plans is a determination of tradeoffs. An important principle regarding target coverage is the trade-off between dose conformity and dose heterogeneity across the target. It is essential to be realistic in the expectations of IMRT and be prepared to accept some dose to critical structures (but keeping them below tolerance) in order to get better target coverage than a conventional plan would provide. Slice-by-slice evaluation of isodose coverage for the location and magnitude of hot and cold spots is required during plan evaluation. Before starting treatment, a set-up verification step is typically helpful, during which the immobilization system and isocenter location are checked. Orthogonal DRR images of the isocenter(s) location can be reproduced by simulator images for better visualization of bony landmarks. Kilovoltage and cone-beam CT imaging techniques are more prevalent in the treatment room for this purpose.

Educational Objectives:

1. Understand issues related to patient immobilization.
2. Identify normal tissues and know their dose/volume constraints.
3. Describe several planning techniques to achieve the best dose distribution.