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Letter to the Editor

Analysis of Radiation Treatment Planning Results for Prostate Cancer Treatment

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Letter to the Editor

Prostate cancer continues to be one of the most commonly diagnosed cancers in the world [1]. There are various types of treatment techniques available for treating prostate cancer. In the past decade, radiotherapy is commonly used to kill the tumor or inhibit its growth. In the recent years, significant improvement in terms of delivery technique has been noticed. Treatment planning has now shifted from the 3 Dimensional Conformal Radiotherapy (3DCRT) to Intensity Modulated Radiation Therapy (IMRT) and Volumetric Modulated Arc Therapy (VMAT). Both the IMRT and VMAT are the two latest technologies used in external beam photon radiation therapy. In short, the IMRT delivers the radiation beam without gantry rotation, whereas in VMAT, radiation beam is delivered by the simultaneous adjustment of gantry speed, multi-collimator leaves, and dose rate [2]. Several cancer researchers [3-14] have studied the use of IMRT and VMAT for the prostate cancer treatment, but the results of one study with that of another are generally conflicting, and this can lead to confusion among the medical communities in choosing one technique over another technique.

It must be noted that the dosimetric studies are generally performed in the Treatment Planning System (TPS), which can vary from one manufacturer to another. The TPSs are used to generate the radiation treatment plans based on the Computed Tomography (CT) dataset, which can be obtained from the CT simulation of the patient. For the IMRT and VMAT, the TPS typically utilizes the inverse planning approach, and plans are optimized by the optimization algorithm. It is important to note that, if the optimization algorithm in one TPS is different from other TPS, dose distributions optimized by two different TPSs will be different. Hence, in order to make fair plan comparison, one should have treatment plans optimized by the same optimized algorithm.

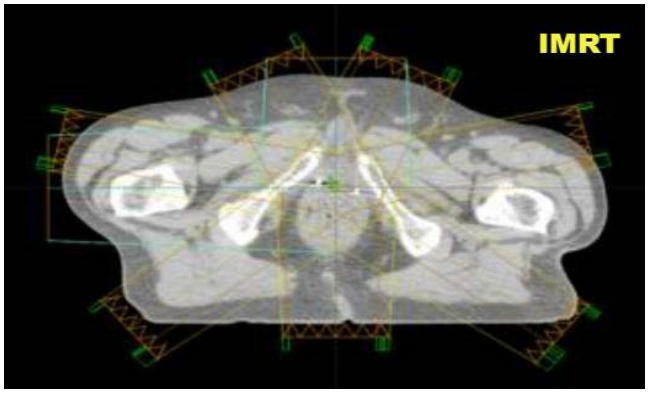

Figure 1: CT slice showing the IMRT beams for prostate cancer.

Dosimetric plans generated on the same TPS may also vary depending on the experience of the treatment planner. Some planners are very skillful with in-depth knowledge of obtaining desired dose distributions, whereas some planners may be novice. Thus, it would be wise to compare the treatment plans done by the same planner instead of comparing the plan done by the experience planner against the plan done by the inexperience planner.

By looking at the literature, one study [3] found out that VMAT produced better results than the IMRT for 292 prostate patients. It was also reported that VMAT is capable of achieving lower dose to the critical structures while having the same target coverage. In another study [4], it was shown that VMAT has capability of escalating the dose to the prostate when compared to the IMRT. Such contrasting results may be a problematic for the general readers, and it is not straight forward to draw the conclusion on which technique provides the advantages.

The literature data shows that results of various other studies are quite contradictory. Studies [12-14] have shown that Single-Arc (SA) technique may provide different results from that of Double-Arc (DA) technique. In one study [10], it was shown, in comparison to the SA, the DA has better dosimetric quality. In a different study [12], it was shown that the partial-SA technique could also produce better results than the full-SA technique. The single arc techniques is more efficient and reduces the treatment time, and this could be very useful to the clinics treating large number of patients on a single lady. However, there are concerns on single arc approach due to large dose to the rectum. The partial-arc approach [14] will be useful in reducing the dose the rectum, and this could potentially reduce the rectal toxicities. Another aspect of the treatment planning is the dose calculations. Each commercial TPS has its own dose calculation engine. The difference in beam modeling within the dose calculation algorithms will produce different dosimetric results [15-17].

The advancement in VMAT has certainly benefitted the busy cancer centers by reducing the treatment delivery time. However, dosimetric advantage of one technique over the other is less clear at this point.

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