Setting Table Coordinates Prior to Treatment Start Reduce Overrides

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Purpose

To reduce the number of overrides over a treatment course due to patient's position, a predicted treatment table position from simulation CT dataset was developed.

Methods

At the patient's initial visit for radiotherapy, the table coordinates for isocenter position is captured and used for the remainder of the treatment course. These values are used as the target position by defining a user-specified range for subsequent fractions. When the position falls outside of this range, therapists must acknowledge and override values to be able to commence treatment.
To predict the table coordinate, a marker wire was placed on the breast board to create a landmark that could be used to establish vertical, lateral, and longitudinal coordinates. Using the current clinical range (Vertical ±1.5 cm, Longitudinal ± 3.0 cm, Lateral ± 3.0 cm), projected overrides were analyzed using both predicted table coordinates and the first day treatment table coordinates.

Results

Sixty-nine isocenters were analyzed covering a total of 971 treatment fractions. With the use of the predicted table coordinates, the number of projected treatment overrides reduces from 25 to 13 (48% reduction). By reducing the longitudinal and lateral range to ± 2.5 cm, it was found that similar amount of overrides (25) would have taken place as if the first day coordinates are used.

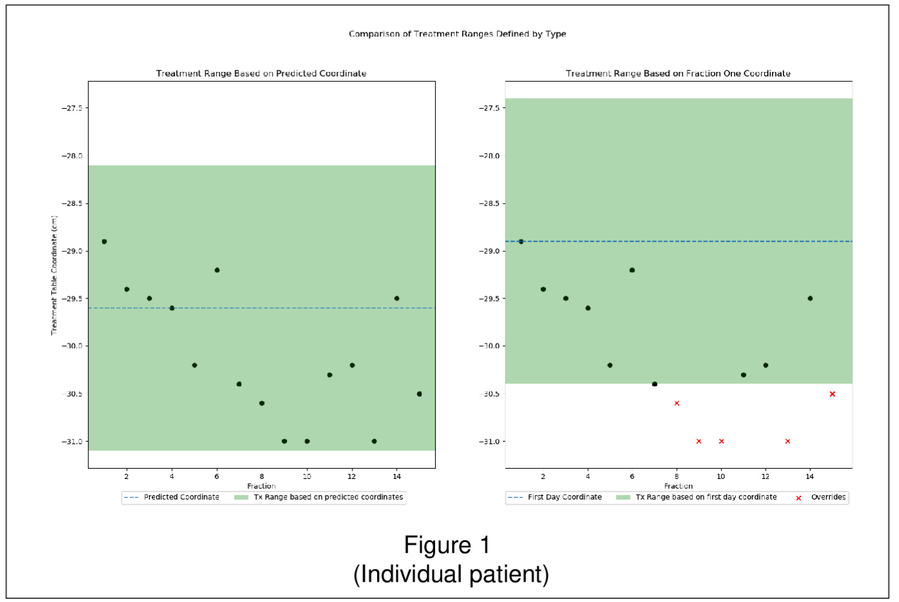

Figure 1
(Individual patient)

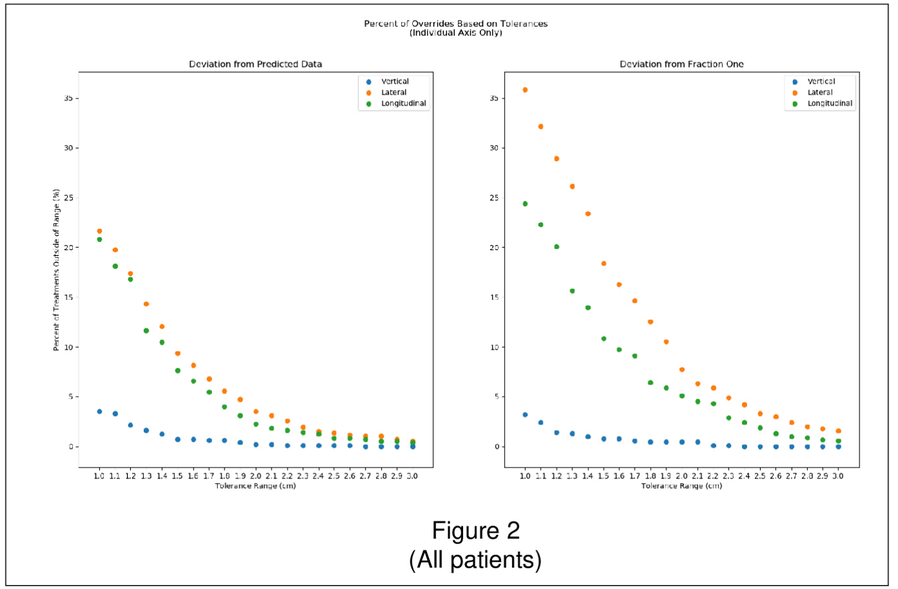

Figure 2
(All patients)

Conclusion

By using a table value predicted from the simulation CT, the number of overrides can be reduced or a similar amount found using a narrower range. A reduction can relieve therapy staff of override fatigue so to more alertly identify positional errors. Newer linear accelerators allow the therapist to translate the treatment couch to the given position. By starting at the predicted table coordinates, this should decrease setup time and lead to more consistent patient positioning.

Discussion

Normally, the method of using table coordinates from the initial patient treatment visit should put those values in the center of the expected daily treatment variation. However, those initial values may not be the actual center of expected daily treatment variation but instead at the edge of the variation range. Even with larger tolerance ranges, this practice can still lead to subsequent fractions needing overrides (Figure 1 (Left)). At our institution, any overrides are investigated by staff. Usually the investigation will result in modifying the table coordinates to a more appropriate number. This can lead to fatigue which may cause a more severe event to be overlooked. With an accurate predicted value that more adequately provides table coordinates prior to treatment, the overall amount of overrides can be reduced. Similarly, by tightening the tolerance tables to match current override percentage, staff may be able to better discern when patients are not set up reproducibly to the simulation setup.

We were able to reduce the amount of overrides by 48% by more accurately predicting treatment table coordinates. Data analysis showed that we could tighten our tolerance tables to help ensure more accurate setups if desired to maintain similar levels of overrides. Our analysis also showed that the vertical treatment ranges were smaller than the lateral and longitudinal ranges. The lateral and longitudinal range space tended to be close to each other when the treatment coordinates were predicted (Figure 2 (Left)). This led to the decision that having the lateral and longitudinal numbers be the same. Similarly, there was a desire that clinically implemented tolerance tables should be in increments of 0.5 cm. The data showed that approximately 99% of all patients individual axis data fall within the tightened tolerance table of vertical ±1.5 cm, and lateral/longitudinal ±2.5 cm