

Inter- and Intra-Fraction Tumor Motion In Lung SBRT

Ismail Faruk DURMUS, Bora TAS

Yeni Yuzyil University Medicine Faculty Gaziosmanpasa Hospital, Department of Radiation Oncology, Istanbul, Turkey.

Purpose:

In Lung SBRT treatments, inter- and intra-fraction movement management are very important. The aim of the study is to determine the tumor movement as inter-fraction and intra-fraction.

Methods:

For 8 lung SBRT patients, CT scans were performed at 1 mm slice intervals. Breath Hold CT was performed using the Catalyst™ surface scanning system in 2 patients and 4DCT scanning was performed in all 6 patients with respiratory phases. In the Monaco 5.11 treatment planning system, plans were prepared using 4-5 non-coplanar VMAT fields. The field to be scanned for intra-fraction CBCT was set to full rotation of 360°. Pre-CBCT scanning had performed in the XVI system before the patient began treatment and the amount of deviation in the tumor was determined in three dimensions. CBCT imaging was then performed intra-fraction while the 360° field was being treated both in the treatment. CBCT imaging was performed with 3 dimensional tumor tracking until the VMAT field was completed. After the VMAT field was completed, the motion in the tumor was examined in off-line mode. According to this procedure, inter- and intra-fraction guide was performed in 45 fractions in 8 lung SBRT patients and the amount of motion in the tumor was found.

Results:

Inter-fraction absolute (+/- independent) deviation amounts; Lateral axis average: 0.48mm, maximum: 1.84mm, longitudinal axis average: 0.29mm, maximum 1.18mm, vertical axis average: 0.34mm, maximum: 1.2mm deviation found. Intra-fraction absolute (+/- independent) deviation amounts; Lateral axis average: 0.07mm, maximum: 0.24mm, longitudinal axis average: 0.14mm, maximum 0.35mm, vertical axis average: 0.12mm, maximum: 0.6mm deviation found.

Conclusions:

When inter- and intra-fraction motion were evaluated, it was found that there was a maximum vertical movement. We found that there may be more differences in patient and tumor position between pre-CBCT scans, with positions according to the laser before treatment. Especially in some patients with 4DCT, the maximum deviation values were found to be 1.5mm more. Because of inter-fractional motion, CBCT scanning is absolutely necessary before treatment begins. In general, three-axis is intra-fractional motion <1mm. Some patients had a maximum movement. In such cases, the target volume margin and the dose to be given should be re-evaluated.

Table 1: intra- and inter-fraction deviation values

	interfraction			Intrafraction		
	lateral	longitudinal	vertikal	lateral	longitudinal	vertikal
$x < -3$	14	9	2	-	-	-
$-2 < x \leq -3$	4	3	3	3	3	2
$-1 < x \leq -2$	6	8	5	4	9	10
$1 \geq x \geq -1$	7	11	8	31	17	20
$2 \geq x > 1$	2	4	6	6	9	11
$3 \geq x > 2$	2	2	4	1	3	2
$3 > x$	10	8	17	-	1	-

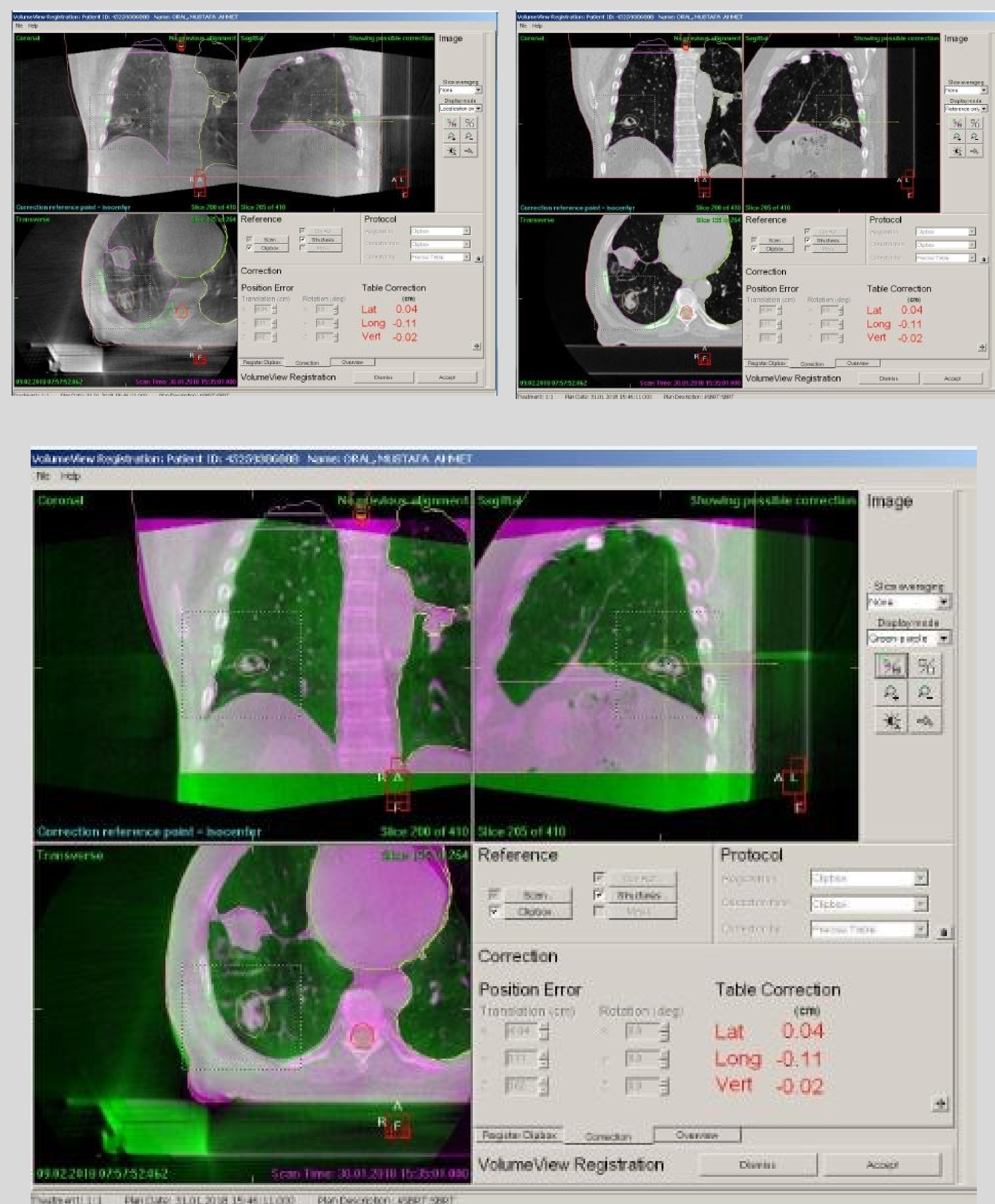


Figure 1. Inter- and intra-fraction XVI images.

