

XXXIII CONGRESSO NAZIONALE AIRO

AIRO2023

BOLOGNA,
27-29 OTTOBRE 2023

PALAZZO DEI CONGRESSI

Radioterapia Oncologica: l'evoluzione al servizio dei pazienti



Associazione Italiana
Radioterapia e Oncologia clinica

XXXIII CONGRESSO NAZIONALE AIRO

AIRO2023

BOLOGNA,
27-29 OTTOBRE 2023

PALAZZO DEI CONGRESSI

Radioterapia Oncologica: l'evoluzione al servizio dei pazienti

A PREDICTIVE MODEL OF DOSIMETRIC VARIATIONS IN HEAD AND NECK CANCER TREATMENTS: UPDATE OF A MONOCENTRIC EXPERIENCE

Michele Aquilano

Radiation Oncology Unit, Mater Olbia Hospital



Associazione Italiana
Radioterapia e Oncologia clinica

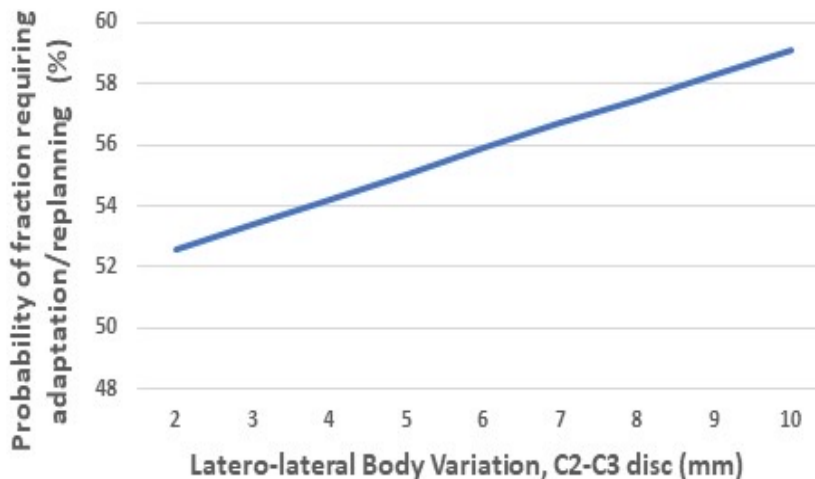
Aims

Adaptive RadioTherapy (ART) requires new indicators to quantify the impact of inter-fraction variations on dose distribution, thus allowing identification of the optimal time to switch towards (online or offline) ART approaches. The aim of our study is the validation of a predictive model able to identify inter treatment fractions with unacceptable dose variations present in head and neck squamous cell carcinoma (HNSCC) patients (pts).

Methods

A total of 14 pts were treated using an Artificial Intelligence (AI)-based linac, acquiring a daily positioning cone beam computed tomography (CBCT) image without online adaptation. Dose regimens ranged between 70 and 60 Gy in 35 and 30 fractions respectively. All CBCT images acquired for patient were rigidly matched to the planning CT (pCT). The variation of V95% of Planning Target Volume High Risk (PTV_{HR}) and max dose of spinal cord, cervical esophagus and constrictors from the original values reported on pCT were collected along with the treatment. Fractions where PTV V95% decreased by 3% and spinal cord Dmax increase of 3% were considered as needed of ART. Radiological parameters were collected on each daily CBCT aligned with pCT to quantify the inter-fraction variability in each RT fraction once compensated for couch shifts. We measured the absolute body variation along antero-posterior (AP) and latero-lateral (LL) directions in the proximity of the plans passing through different vertebrae (C2, C3) and the corresponding discs (C2-C3, C3-C4). We analysed the correlation between such parameters and the fractions needed for adaptation.

Figure 1

**Results**

212/400 fractions analysed required online adaptation. At the univariate analysis, the most significant parameter was the body variation along the LL direction measured through the C2-C3 disc, able to predict variation of PTV, spinal cord ($p=1.7 \times 10^{-3}$), cervical esophagus ($p=3.44 \times 10^{-13}$) and constrictors (4.78×10^{-4}). Figure 1 reports the probability of obtaining a fraction requiring online adaptation on the basis of the body variation in LL direction, obtained thanks to the predictive model developed.

Conclusions

A new metric to define the need for replanning was proposed based on body variation measured along the LL direction through the C2-C3 disc: if such value results > 5 mm the treatment fraction has to be considered needed of replanning or ART (85% of probability of not meeting the tolerance criteria). More research is needed to address the ART's role in HNSCC.