

# Evaluation of positioning and dosimetry uncertainties in patients treated with intensity modulation radiotherapy (IMRT) for nasopharyngeal cancers in Tunisia

Thursday, 18 February 2021 14:30 (10 minutes)

**Purpose:** The success of the IMRT treatment for nasopharyngeal patients is hampered by many sources of geometric errors and imprecision that can potentially deviate the delivered dose from the planned one, of which positioning errors are essentially noted. In fact, the radiotherapy treatment is spread over several weeks while the ballistics of the treatment are defined on a single fixed CT scan acquired during the preparation of the treatment. The reproducibility of this planned position during irradiation sessions is then of critical importance. An error in positioning or placement may be responsible for an underdosing of the target volume and/or an overdosing of the organs at risk. The aim of the work was to detect potential setup and dosimetry errors using daily kilovoltage images and EPID measurements of repeatability of the dose distribution during irradiation of IMRT patients.

**Methodology:** A Varian Clinac iX, equipped with an amorphous-silicon EPID aS1000, was used in this study. We evaluated nine nasopharyngeal patients treated with IMRT. The dose prescribed was 60-70 Gy in 30-35 fractions. Immobilization of the patient was taken with masks 5 points. During the treatment, two orthogonal Kilovoltage images are obtained and compared with reference bone anatomy using automatic fusion to DRR images. The result of comparison gives the setup uncertainty in 3 directions (vertical, lateral and longitudinal). Deviations generated in the translational coordinates were analyzed and expressed in terms of mean values and their standard deviations. Additionally, portal imaging is often used for pre and during treatment anatomical setup verification. Images were collected with an EPID device for each IMRT subfield daily and compared to reference images (the first fluence treatment map) using the gamma method (DTA 3 mm, DD3%).

**Results:** A total of 610 KV images and 2622 portal images were acquired over the course of the study. Setup errors were characterized by their mean values and standard deviations:  $-0.2 \pm 2$  mm in the vertical direction,  $0.6 \pm 5.2$  mm in the longitudinal direction and  $-0.7 \pm 5.4$  mm in the lateral direction. For the dosimetry part, the average gamma index results were about  $95.2\% \pm 3\%$ . For 66% evaluated subfields, gamma index values were above 97% of analyzing fields. Only 2% of all evaluated data were with the Gamma index below 70%.

**Conclusion:** The magnitude of the random, systematic and overall errors was quantified. A systematic error may be understood as an average variation occurred during the treatment. A random error on the other hand, can be defined as the dispersion of systematic errors over time of treatment. This study emphasizes the importance of daily imaging in order to reduce setup errors and daily verification of the fluence map in order to provide extra information about day-to-day repeatability of treatment.

## Country or Int. Organization

Tunisia

## Affiliation

University Tunis El Manar I TUNISIE and Medical physics unit, Radiotherapy department of Institute Salah Azaiz

**Primary author:** ELAMRI, Nesrine (University Tunis El Manar I, Medical physics unit, Radiotherapy department of Institute Salah Azaiz ,Tunis)

**Co-authors:** Dr BEN SALEM, Lotfi (Medical physics unit, Radiotherapy department of Institute Salah Azaiz , Tunis); Dr MAHJoubi, khalil (Radiotherapy department of Institute Salah Azaiz, Tunis); SADOK, Ali (Medical

physics unit, Radiotherapy department of Institute Salah Azaiz , Tunis); SAIDANI, intidhar (Salah Azaeiz Institute); TOUNSSI, Nedra (Medical physics unit, Radiotherapy department of Institute Salah Azaiz , Tunis); MAHDOUANI, Marouen (Medical physics unit, Radiotherapy department of Institute Salah Azaiz , Tunis); ZAIDI, emna (Medical physics unit, Radiotherapy department of Institute Salah Azaiz , Tunis); Prof. VYNCKIER , Stefaan (Université Catholique de Louvain); Prof. NASR, Chiraz (Radiotherapy department of Institute Salah Azaiz, Tunis); Prof. BESBES, Mounir (Medical physics unit, Radiotherapy department of Institute Salah Azaiz , Tunis)

**Presenter:** ELAMRI, Nesrine (University Tunis El Manar I, Medical physics unit, Radiotherapy department of Institute Salah Azaiz ,Tunis)

**Session Classification:** Physics Papers 2

**Track Classification:** Medical Physics