Purpose or Objective: Thyroid gland is often irradiated in radiotherapy (RT) of nasopharyngeal cancer (NPC) patients leading to radiation induced thyroid disorder. This study aimed to evaluate the pattern of thyroid gland changes in the first 3 years after the completion of chemoradiotherapy.

Material and Methods: Adult NPC patients treated by concurrent chemo-RT (Cisplatin and 5 Fluorouracil) between 2007 and 2011 were recruited. A 7-beam intensity modulated radiotherapy (IMRT) plan was delivered using 6 MV photons. 70 and 66 Gy were prescribed to the PTVs of the nasopharynx and neck lymphatics respectively. Mean thyroid dose was obtained from dose volume histogram using the treatment planning system. Before RT, apart from planning CT, baseline thyroid hormone levels of each patient, comprising free T3 (fT3), free T4 (fT4) and TSH were established by extracting 6 ml of blood. Repeated measurements of the fT3, fT4, TSH and CT were taken at 3, 6, 12, 18, 24, 30 and 36 months after completion of RT. Readings of the 3 hormone levels and thyroid volume obtained from CT at each time interval were recorded. Trend lines of each parameter were plotted. The incidence of hypothyroidism was recorded based on the hormonal findings. The association between the mean thyroid dose and hypothyroidism was evaluated.

Results: 21 patients (M = 13, F = 8) completed the 3-year follow up. The mean thyroid dose ranged from 18.3-61.5 Gy (average 42.8±9.6 Gy). The average volume of the thyroid gland decreased from 17.6 cm3 at pre-RT to 12.3 cm3 at 18 months and remained stable afterward. The average level of fT4 decreased rapidly in the first 6 months, then slowed down and remained stable after 24 months (Fig 1). The average TSH level showed a significant rise between 6 to 18 months and became steady afterward. The level of fT3 remained constant throughout the study period. The incidence of hypothyroidism increased from 7.8% at 3 months to 34.4% at 18 months and remained relatively steady thereafter. Significant association was found between mean thyroid dose and incidence of hypothyroidism.

Conclusion: Our study demonstrated that 18-24 months after chemoradiotherapy was a critical time interval where 1) shrinkage of thyroid gland was stabilized; 2) decrease of fT4 and increase of TSH levels became steady; 3) incidence of hypothyroidism started to rise. All the parameters reached a relatively steady state after 36 months. Applying dose constraints to the thyroid gland in RT treatment planning was recommended to reduce the risk of hypothyroidism.

Purpose or Objective: Cancer cachexia is a paraneoplastic syndrome characterized by weight loss (WL) and sarcopenia. Aim of the study was to assess the impact of cachexia on head and neck changes during definitive cisplatin- image-guided volumetric modulated arc radiotherapy (VMAT) in a series of locally advanced oropharyngeal cancer.

Material and Methods: Volume variations of sternocleidomastoid muscle (SCM) were considered as surrogate of muscle changes related to sarcopenia. For the purpose of the study, two head and neck diameters, encompassing the cranial limits of II and III neck nodal levels (here defined as “head-diameter” and “neck-diameter”, respectively), were measured. All parameters analyzed were defined retrospectively by means of on-board cone beam computed tomography (kV-CBCT) images at 1th, 8th, 15th, 22th radiotherapy fraction (fx) and at the end of treatment. Cachexia was defined as WL > 5% during treatment. Statistical analysis was conducted correlating the parameters changes with three WL ranges: < 5%, 5-9% and > 10%.

Results: 30 patients, underwent to definitive cisplatin-VMAT, were retrospectively evaluated. A total of 150 contoured SCMs and 300 diameters were collected. Median WL of patients during treatment was 6.5% (range, 0-16%). The most significant SCM shrinkage was recorded at 15th fx (mean reduction of 1.6 cm), in correlation with WL 5-9% and WL > 10% (p 0.001). For “head-diameter” the peak reduction was recorded at the 15th fx (mean reduction of 8 mm), statistically correlated to WL > 10% (p 0.001). The peak reduction of “neck-diameter” was registered at the 22th fx (mean value of 6 mm). “Neck-diameter” gradually reduced until the end of treatment for WL > 5%.

Conclusion: The head and neck volume changes here analyzed showed to be potentially related to cancer cachexia. Present data could provide relevant adaptive radiation therapy implications for further investigations.

Purpose or Objective: To assess predictors of mucositis in oropharyngeal and oral cavity cancer after definitive or adjuvant volumetric modulated arc radiotherapy (VMAT) +/- chemotherapy.

Material and Methods: For the purpose of this retrospective analysis, inclusion criteria were: age ≥ 18 years, histologically proven carcinoma of the oropharynx and oral cavity, no dysphagia at baseline, radical and adjuvant treatment with VMAT (RadioArcs®, Varian Medical System, Palo Alto, CA, USA). Fifty patients were evaluated. Statistical Analysis was performed for the following parameters as potential predictors of mucositis ≥ G2: total oral mucosa (OM) and OM minus target low-high radiation dose regions (PTVs), mean dose (Dmean) and maximum dose (Dmax), chemotherapy, weight loss, dysphagia.

Results: mucositis ≥ G2 was related to total OM Dmean ≥ 50 Gy (p .02, CI 95%: 0.1-1.3) and Dmax ≥ 65Gy (p .04, CI 95%: 0.1-1.3). At logistic regression, for Dmean ≥ 50 Gy and Dmax ≥ 65 Gy, the risk of mucositis ≥ G2 increased around 5 times (p .04). Considering OM minus target PTVs, the following volumetric constraints were related to mucositis ≥ G2: V45Gy > 40 % (p .04, CI 95%: 0.9-2.3), V50Gy > 30 % (p .009, CI 95%: 0.6-1.4), V55 Gy > 20 % (p.003, CI 95%: 0.5-1.2). At logistic regression, for OM minus target PTVs V45 > 40, V50 > 30 and V55 ≥ 20 risk of mucositis G2 increased around 5 times (p .05). A ratio between total OM and OM minus target PTVs > 2.5 is related to G3 mucositis (p .03, CI 95%: 0.8-1.8).