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Tumor Size Changes after Neoadjuvant Systemic Therapy for Advanced Oropharyngeal Squamous Cell Carcinoma

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Abstract

Objective: In this study, we assessed tumor size changes after neoadjuvant systemic treatment in patients with advanced oropharyngeal squamous cell carcinoma (OSCC).

Materials and methods: Primary objective of this study was to assess tumor size changes after neoadjuvant systemic treatment in patients with advanced OSCC. For this purpose, advanced OSCC patients with available imaging data as part of initial workup were studied. All included patients received upfront neoadjuvant systemic treatment and then were referred for radiation therapy (RT) at Department of Radiation Oncology at Gulhane Medical Faculty, University of Health Sciences. We have performed a comparative analysis for tumor sizes at diagnostic CT scan of the patients and at CT-simulation for radiation treatment planning after neoadjuvant systemic treatment. CTsimulations of the patients have been performed at CT-simulator (GE Lightspeed RT, GE Healthcare, Chalfont St. Giles, UK) available at our institution. Tumor size changes after neoadjuvant systemic treatment was documented for comparative evaluation.

Results: As the main result of our study, we found a mean decrease of 35% in tumor size after neoadjuvant systemic treatment for patients with advanced OSCC.

Conclusion: Our results may have implications for implementation of adaptive RT strategies despite the need for further supporting evidence.

Keywords: Oropharyngeal squamous cell carcinoma (OSCC); Radiation therapy (RT); Neoadjuvant chemotherapy

Introduction

Oropharyngeal squamous cell carcinoma (OSCC) remains to be a public health concern with its critical incidence globally [1-7]. Unfortunately, both the disease itself and the treatments used to treat OSCC may result in significant morbidity in affected patients. Surgery, radiation therapy (RT), and systemic agents may be used for optimal management of OSCC. Several forms of irradiation may be utilized, and contemporary approaches such as intensity modulation and adaptive RT techniques show promise for optimal radiotherapeutic management. While the use of high effective doses may clearly contribute to improved local control outcomes, adverse effects of irradiation should also be considered to maintain patient's quality of life. There have been significant advances in technology in the millenium era which contributed to improved outcomes with RT. Molecular imaging methods, automatic segmentation techniques, Image Guided RT (IGRT), Intensity Modulated RT (IMRT), stereotactic RT, and adaptive RT (ART) have been introduced for optimal radiotherapeutic management of patients [8-49]. Clearly, best therapeutic results might only be obtained by close collaboration among related disciplines for cancer management.

Tumor boards contribute to bringing together surgical oncologists, radiation oncologists, medical oncologists, imaging and other relevant specialists to discuss about patient, tumor, and treatment characteristics to find out the optimal management strategy for individualized patient management. Neoadjuvant systemic therapy has been suggested to play a role for management of advanced head and neck cancers. The rationale behind neoadjuvant systemic treatment includes decreasing the disease burden and thus facilitating the implementation of subsequent therapeutic strategies. Also, neoadjuvant systemic treatment may

prevent widespread dissemination of disease. However, there may also be controversies regarding neoadjuvant systemic treatments such as the risk of delayed local treatments such as RT or surgery. Nevertheless, selected patients with advanced OSCC may benefit from neoadjuvant systemic treatment. In this study, we assessed tumor size changes after neoadjuvant systemic treatment in patients with advanced OSCC.

Materials and Methods

We have been treating a high patient population from several places from Turkey and abroad at Department of Radiation Oncology at Gulhane Medical Faculty, University of Health Sciences. Within this context, a plethora of benign and malignant tumors are irradiated at our tertiary cancer center for decades. Primary objective of this study was to assess tumor size changes after neoadjuvant systemic treatment in patients with advanced OSCC. For this purpose, advanced OSCC patients with available imaging data as part of initial workup were studied. All included patients received upfront neoadjuvant systemic treatment and then were referred for RT at Department of Radiation Oncology at Gulhane Medical Faculty, University of Health Sciences. We have performed a comparative analysis for tumor sizes at diagnostic CT scan of the patients and at CT-simulation for radiation treatment planning after neoadjuvant systemic treatment. CTsimulations of the patients have been performed at CT-simulator (GE Lightspeed RT, GE Healthcare, Chalfont St. Giles, UK) available at our institution. Tumor size changes after neoadjuvant systemic treatment was documented for comparative evaluation.

A Linear Accelerator (LINAC) furnished with contemporary IGRT techniques was used for RT. After rigid patient immobilization, planning CT images were acquired at CT simulator for radiation treatment planning. Afterwards, acquired RT planning images were sent to the delineation workstation via the network. Treatment volumes and critical organs were outlined on these images and structure sets were generated. All patients were treated by using state of the art RT techniques at Department of Radiation Oncology at Gulhane Medical Faculty, University of Health Sciences.

Results

We have designed this original research article in an attempt to evaluate tumor size changes after neoadjuvant systemic treatment in patients with advanced OSCC. Irradiation was carried out at our Radiation Oncology Department of Gulhane Medical Faculty at University of Health Sciences, Ankara. Before treatment, all included patients were individually assessed by a multidisciplinary team of experts from surgical oncology, medical oncology, and radiation oncology. Advanced OSCC patients with available imaging data as part of initial workup were included. Selected patients received upfront neoadjuvant systemic treatment and then were referred for RT at Department of Radiation Oncology at Gulhane Medical Faculty, University of Health Sciences. We have performed a comparative analysis for tumor sizes at diagnostic CT scan of the patients and at CT-simulation for radiation treatment planning after neoadjuvant systemic treatment. CTsimulations of the patients have been performed at CT-simulator (GE Lightspeed RT, GE Healthcare, Chalfont St. Giles, UK) available at our institution. Tumor size changes after neoadjuvant systemic treatment was documented for comparative evaluation. As the main result of our study, we found a mean decrease of 35% in tumor size after neoadjuvant systemic treatment for patients with advanced OSCC.

Optimal RT planning process included consideration of lesion sizes, localization and association with nearby critical structures. Radiation physicists have been involved in RT planning process with consideration of reports by American Association of Physicists in Medicine (AAPM) and International Commission on Radiation Units and Measurements (ICRU). Accurate RT planning procedure included consideration of electron density, tissue heterogeneity, CT number and HU values in CT images. Main objective of RT planning was to achieve optimal coverage of treatment volumes along with minimized exposure of surrounding critical structures. All patients were treated by using state of the art RT techniques at Department of Radiation Oncology at Gulhane Medical Faculty, University of Health Sciences.

Discussion

OSCC comprises a public health concern with its critical incidence around the globe [1-7]. Unfortunately, both the disease itself and the treatments used to treat OSCC may result in significant morbidity in affected patients. Surgery, RT, and systemic agents may be used for optimal management of OSCC. Several forms of irradiation may be utilized, and contemporary approaches such as intensity modulation and adaptive RT techniques show promise for optimal radiotherapeutic management. While the use of high effective doses may clearly contribute to improved local control outcomes, adverse effects of irradiation should also be considered to maintain patient's quality of life.

There have been significant advances in technology in the millenium era which contributed to improved outcomes with RT. Molecular imaging methods, automatic segmentation techniques, IGRT, IMRT, stereotactic RT, and ART were introduced for optimal radiotherapeutic management of patients [8-49]. Admittedly, best therapeutic results might only be achieved by close collaboration among related disciplines for cancer management. Tumor boards contribute to bringing together surgical oncologists, radiation oncologists, medical oncologists, imaging and other relevant specialists to discuss about patient, tumor, and treatment characteristics to find out the optimal management strategy for individualized patient management. Neoadjuvant systemic therapy has been suggested to play a role for management of advanced head and neck cancers. The rationale behind

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neoadjuvant systemic treatment includes decreasing the disease burden and thus facilitating the implementation of subsequent therapeutic strategies. Also, neoadjuvant systemic treatment may prevent widespread dissemination of disease. However, there may also be controversies regarding neoadjuvant systemic treatments such as the risk of delayed local treatments such as RT or surgery. Nevertheless, selected patients with advanced OSCC may benefit from neoadjuvant systemic treatment.

In this study, we assessed tumor size changes after neoadjuvant systemic treatment in patients with advanced OSCC. Patients with available imaging data as part of initial workup were studied. All included patients received upfront neoadjuvant systemic treatment and then were referred for RT at Department of Radiation Oncology at Gulhane Medical Faculty, University of Health Sciences. We have performed a comparative analysis for tumor sizes at diagnostic CT scan of the patients and at CT-simulation for radiation treatment planning after neoadjuvant systemic treatment. CTsimulations of the patients have been performed at CT-simulator (GE Lightspeed RT, GE Healthcare, Chalfont St. Giles, UK) available at our institution. Tumor size changes after neoadjuvant systemic treatment was documented for comparative evaluation. As the main result of our study, we found a mean decrease of 35% in tumor size after neoadjuvant systemic treatment for patients with advanced OSCC.

From the perspective of radiation oncology, optimal target definition and critical organ sparing are among the critical components of optimal radiotherapeutic management. While definition of larger treatment volumes may result in excessive RT toxicity, definition of smaller treatment volumes may subsequently lead to treatment failures. Adaptive RT approaches and multimodality imaging based target definition have been suggested for achieving improved outcomes [50-96]. In this study, we have documented tumor size changes after neoadjuvant systemic treatment comparative evaluation. And as the main result of our study, we found a mean decrease of 35% in tumor size after neoadjuvant systemic treatment for patients with advanced OSCC. Our results may have implications for implementation of adaptive RT strategies despite the need for further supporting evidence.

Conflict of Interest

There are no conflicts of interest and no acknowledgements.

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