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Evaluation of Volumetric Changes in Transglottic Laryngeal Cancers After Induction Chemotherapy

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ABSTRACT

Objective: Systemic therapy is an indispensable component of multidisciplinary management for selected patients with laryngeal cancer. Utilization of induction chemotherapy may be suggested in individualized management considering patient, tumor, and treatment characteristics. In this study, we focused on volumetric changes in transglottic laryngeal cancers treated with induction chemotherapy. We documented changes in tumor volume after induction chemotherapy in patients with transglottic laryngeal cancer.

Materials and Methods: Objective of this study was to explore changes in tumor volume following induction chemotherapy for transglottic laryngeal cancer. For this purpose, patients with transglottic laryngeal cancer having available imaging data as part of initial workup were selected. All included patients received induction chemotherapy and were later referred for RT at Department of Radiation Oncology at Gulhane Medical Faculty, University of Health Sciences. We have performed a comparative analysis for tumor volumes at diagnostic CT scan of the patients and at CT-simulation for radiation treatment planning following induction chemotherapy. CTsimulations of the patients have been performed at CT-simulator (GE Lightspeed RT, GE Healthcare, Chalfont St. Giles, UK) available at our referral institution. Changes in tumor volume following induction chemotherapy was documented for comparative analysis.

Results: We found out that there was a mean decrease of 28% in tumor size after induction chemotherapy in our patients with transglottic laryngeal cancer.

Conclusion: We believe that our results may have implications for adoption of adaptive radiotherapeutic strategies for optimal management of transglottic laryngeal cancers, however, further supporting studies are warranted.

Keywords: Transglottic Laryngeal Cancer; Radiation Therapy (RT); Chemotherapy

Abbrevations: RT: Radiation Therapy; IGRT: Image Guided RT; IMRT: Intensity Modulated RT; ART: Adaptive RT; LINAC: Linear Accelerator; AAPM: American Association of Physicists in Medicine; ICRU: International Commission on Radiation Units and Measurements

Introduction

Laryngeal cancers are among the most common of head and neck tumors worldwide [1-7]. Both the tumor itself and administered treatments may cause excessive morbidity in affected patients. Surgery, radiation therapy (RT) and systemic agents may be used for optimal management of laryngeal cancers. Several forms of irradiation and many modernized techniques may be utilized, and sophisticated strategies such as intensity modulation and adaptive RT techniques may offer optimal radiotherapeutic management. Indeed, adverse effects of treatment has gained utmost importance recently due to improved local control and survival outcomes with more effective local and systemic therapeutic approaches. Molecular imaging methods, automatic segmentation techniques, Image Guided RT (IGRT), Intensity Modulated RT (IMRT), stereotactic RT, adaptive RT (ART) and multimodality imaging based target definition have been introduced for optimal RT [8-93]. Obviously, best therapeutic results are obtained by close collaboration among related disciplines for cancer

management. Tumor boards clearly contribute to bringing together surgical oncologists, radiation oncologists, medical oncologists, imaging and other relevant specialists to discuss about patient, tumor, and treatment characteristics to propose the optimal treatment approach for individualized patient management. Systemic therapy is an indispensable component of multidisciplinary management for selected patients with laryngeal cancer. Utilization of induction chemotherapy may be suggested in individualized management considering patient, tumor, and treatment characteristics. In this study, we focused on volumetric changes in transglottic laryngeal cancers treated with induction chemotherapy. We documented changes in tumor volume after induction chemotherapy in patients with transglottic laryngeal cancer.

Materials and Methods

We have been treating a huge patient population from several places from Turkey and abroad at Department of Radiation Oncology at Gulhane Medical Faculty, University of Health Sciences for decades. In our tertiary cancer center and referral institution, many benign and malignant tumors are irradiated. Objective of this study was to explore changes in tumor volume following induction chemotherapy for transglottic laryngeal cancer. For this purpose, patients with transglottic laryngeal cancer having available imaging data as part of initial workup were selected. All included patients received induction chemotherapy and were later referred for RT at Department of Radiation Oncology at Gulhane Medical Faculty, University of Health Sciences. We have performed a comparative analysis for tumor volumes at diagnostic CT scan of the patients and at CT-simulation for radiation treatment planning following induction chemotherapy. CTsimulations of the patients have been performed at CT-simulator (GE Lightspeed RT, GE Healthcare, Chalfont St. Giles, UK) available at our referral institution. Changes in tumor volume following induction chemotherapy was documented for comparative analysis. Linear Accelerator (LINAC) with the capability of contemporary IGRT techniques was utilized for RT. Following rigid patient immobilization, planning CT images have been acquired at CT simulator for radiation treatment planning. Afterwards, acquired RT planning images were transferred to the contouring workstation by the network. Treatment volumes and normal tissues have been determined 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

Our original research article has been designed to assess changes in tumor volume following induction chemotherapy for transglottic laryngeal cancer. Irradiation was performed 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 disciplines. Patients with transglottic laryngeal cancer having available imaging data as part of initial workup were included. Selected patients received induction chemotherapy and afterwards 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 volumes at diagnostic CT scan of the patients and at CT-simulation for radiation treatment planning after induction chemotherapy. CTsimulations of the patients have been performed at CT-simulator (GE Lightspeed RT, GE Healthcare, Chalfont St. Giles, UK) available at our institution. Changes in tumor volume after induction chemotherapy have been documented for comparative analysis. We found out that there was a mean decrease of 28% in tumor size after induction chemotherapy in our patients with transglottic laryngeal cancer. Optimizal RT planning process included consideration of lesion sizes, localization and association with surrounding normal tissues. Radiation physicists have been involved in RT planning procedure 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 encompassing of treatment volumes along with minimized exposure of surrounding critical structures. All patients were irradiated by using state of the art RT techniques at Department of Radiation Oncology at Gulhane Medical Faculty, University of Health Sciences.

Discussion

Laryngeal cancers are among the most common of head and neck tumors worldwide [1-7]. Both the tumor itself and administered treatments may cause excessive morbidity in affected patients. Surgery, RT and systemic agents may be used for optimal management of laryngeal cancers. Several forms of irradiation and many modernized techniques may be utilized, and sophisticated strategies such as intensity modulation and adaptive RT techniques may offer optimal radiotherapeutic management. Indeed, adverse effects of treatment has gained utmost importance recently due to improved local control and survival outcomes with more effective local and systemic therapeutic approaches. Molecular imaging methods, automatic segmentation techniques, IGRT, IMRT, stereotactic RT, ART and multimodality imaging based target definition have been introduced for optimal RT [8-93]. Clearly, best therapeutic results are obtained by close collaboration among related disciplines for cancer management. Tumor boards clearly contribute to bringing together surgical oncologists, radiation oncologists, medical oncologists, imaging and other relevant specialists to discuss about patient, tumor, and treatment characteristics to propose the optimal treatment approach for individualized patient management. Systemic therapy is an indispensable component of multidisciplinary management for selected patients with laryngeal

cancer. Utilization of induction chemotherapy may be suggested in individualized management considering patient, tumor, and treatment characteristics. In this study, we focused on volumetric changes in transglottic laryngeal cancers treated with induction chemotherapy.

We documented changes in tumor volume after induction chemotherapy in patients with transglottic laryngeal cancer. We have performed a comparative analysis for tumor volumes at diagnostic CT scan of the patients and at CT-simulation for radiation treatment planning following induction chemotherapy. CTsimulations of the patients have been performed at CT-simulator (GE Lightspeed RT, GE Healthcare, Chalfont St. Giles, UK) available at our referral institution. Changes in tumor volume following induction chemotherapy was documented for comparative analysis. Linear Accelerator (LINAC) with the capability of contemporary IGRT techniques was utilized for RT. Following rigid patient immobilization, planning CT images have been acquired at CT simulator for radiation treatment planning. Afterwards, acquired RT planning images were transferred to the contouring workstation by the network. Treatment volumes and normal tissues have been determined 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. We found out that there was a mean decrease of 28% in tumor size after induction chemotherapy in our patients with transglottic laryngeal cancer. We believe that our results may have implications for adoption of adaptive radiotherapeutic strategies for optimal management of transglottic laryngeal cancers, however, further supporting studies are warranted.

Authors Confilicts

There are no conflicts of interest.

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