Cancer Therapy & Oncology
International Journal
ISSN: 2473-554X

Juniper Publishers
key to the Researchers

Research Article
Volume 31 Issue 1 - January 2026
DOI: 10.19080/CTOIJ.2026.31.556305

Cancer Ther Oncol Int J

Assessment of Tumor Size Changes Following Systemic Therapy for Triple Negative Breast Cancer (TNBC)

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Submission: December 05, 2025; **Published**: January 09, 2026

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Abstract

Objective: Cancers of the breast comprise a major public health concern with critical incidence, morbidity and mortality rates worldwide. Triple negative breast cancer (TNBC) is a distinctive subgroup of breast cancers with a more aggressive disease course and poorer prognosis. Systemic therapies may be utilized for TNBC management. While treatment sequencing and therapies for TNBC are evolving, TNBC patients may benefit from systemic treatment. In this study, tumor size changes after systemic therapy for TNBC was evaluated.

Materials and Methods: In the context of this study, purpose was assessment of tumor size changes after systemic therapy for TNBC. For this endpoint, patients with TNBC having available imaging data as part of their workup have been evaluated. All included patients have received systemic treatment and then were referred for RT at Department of Radiation Oncology at Balikesir Atatürk Health and Application Center, University of Health Sciences. I performed a comparative analysis of tumor sizes at imaging scans of the patients before and after systemic treatment.

Results: I found a considerable decrease in tumor sizes after systemic treatment for patients with TNBC.

Conclusion: In the current study, I documented tumor size changes following systemic treatment for TNBC. As the primary result, I found a considerable decrease in tumor sizes after systemic treatment for patients with TNBC. My findings might have implications for consideration of adaptive RT strategies for these patients; however, further studies are warranted to shed light on this critical issue.

Keywords: Triple negative breast cancer (TNBC); Systemic treatment; Tumor size changes; Computed Tomography; Adaptive

Abbreviations: TNBC: Triple Negative Breast Cancer; IGRT: Image Guided RT; Adaptive RT; IMRT: Intensity Modulated RT; CT: Computed Tomography; LINAC: Linear Accelerator

Introduction

Cancers of the breast comprise a major public health concern with critical incidence, morbidity and mortality rates worldwide [1-3]. Triple negative breast cancer (TNBC) is a distinctive subgroup of breast cancers with a more aggressive disease course and poorer prognosis [4-6]. Unfortunately, both the disease itself and treatments used for management of TNBC may deteriorate quality of life with adverse events. For the time being, optimal management of TNBC may be achieved through combinations of treatment modalities including surgery, radiation therapy (RT), and systemic agents [4-6]. As for RT, several forms of irradiation could be utilized, and contemporary technologies including intensity modulation and adaptive RT techniques offer great potential for improved outcomes.

While the use of higher effective doses may result in increased local control rates, toxicity profile of radiation delivery should be strongly considered for quality-of-life concerns. Recent years have witnessed unprecedented advances in technology which paved the way for improved radiotherapeutic results. Automatic segmentation techniques, Image Guided RT (IGRT), molecular imaging methods, Intensity Modulated RT (IMRT), stereotactic RT, and adaptive RT (ART) have been introduced for improved therapeutic ratio [7-100]. In the context of millenium era, optimal therapeutic outcomes for TNBC might only be achieved through close collaboration among relevant disciplines for cancer management. Tumor boards offer improved cooperation among

surgical oncologists, radiation oncologists, and medical oncologists by providing a good platform for discussing thoroughly about individualized patient, tumor, and treatment characteristics.

Thus, tumor boards may improve determining the individualized therapy for optimal patient management. Systemic therapies may be utilized for TNBC management [4-6]. The rationale behind systemic treatment might include reduction of the disease burden before administration of subsequent therapies. Also, systemic treatment could prevent widespread dissemination of the disease which may be critical considering the aggressive clinical course of TNBC. On the other hand, there may also be controversies regarding utilization and sequencing of systemic treatments in view of the risk for delaying local treatments such as RT or surgery. While treatment sequencing and therapies for TNBC are evolving, selected subgroups of TNBC patients may benefit from systemic treatment. In this study, I evaluated tumor size changes after systemic therapy for TNBC.

Materials and Methods

Department of Radiation Oncology at Balikesir Atatürk Health and Application Center, University of Health Sciences has been serving as a tertiary cancer center for patients from Turkey and abroad for decades. Several benign and malignant tumors are irradiated here by using modernized equipment and contemporary technologies including IGRT, IMRT, ART, stereotactic RT, automatic segmentation techniques, and molecular imaging methods [7-94]. In the context of this study, I aimed at assessment of tumor size changes after systemic therapy for TNBC. For this endpoint, patients with TNBC having available imaging data as part of their workup have been evaluated. All included patients have received systemic treatment and then were referred for RT at Department of Radiation Oncology at Balikesir Atatürk Health and Application Center, University of Health Sciences.

I performed a comparative analysis of tumor sizes at imaging scans of the patients before and after systemic treatment. Computed tomography (CT) simulations have been performed at CT-simulator (GE Lightspeed RT, GE Healthcare, Chalfont St. Giles, UK) available at our department. Tumor size changes after systemic treatment have been documented for comparative assessment and analysis. Linear Accelerator (LINAC) with the capability of incorporating state-of-the-art IGRT techniques has been utilized for RT. After patient immobilization, planning CT images have been acquired at the CT simulator for RT planning. Thereafter, acquired RT planning images have been transferred to the delineation workstation by the network. Target volumes and critical structures have been contoured on these images and structure sets have been generated. All patients received RT by integration of contemporary RT techniques at Department of Radiation Oncology at Balikesir Atatürk Health and Application Center, University of Health Sciences.

1. Results

This study was designed to investigate tumor size changes following systemic therapy for TNBC. Irradiation procedures have been performed at our Radiation Oncology Department of Balikesir Atatürk Health and Application Center at University of Health Sciences, Balikesir. Before therapy, all included patients have been individually evaluated by a multidisciplinary team of experts from surgical oncology, medical oncology, and radiation oncology. Patients with TNBC having available imaging data as part of their workup were included. I performed a comparative analysis for tumor sizes at imaging scans of the patients before and after systemic treatment. Treatment simulations of the patients were performed at CT-simulator (GE Lightspeed RT, GE Healthcare, Chalfont St. Giles, UK) available at our tertiary cancer center. Tumor size changes after systemic treatment were documented for comparative assessment. As the main outcome of this study, I found a considerable decrease in tumor sizes after systemic treatment for patients with TNBC.

Optimal RT planning processes included consideration of lesion sizes, localization and association with nearby critical structures. Radiation physicists participated in RT planning procedures with consideration of reports by American Association of Physicists in Medicine (AAPM) and International Commission on Radiation Units and Measurements (ICRU). Monaco 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 organs. All patients have been treated by using contemporary RT techniques at Department of Radiation Oncology at Balikesir Atatürk Health and Application Center, University of Health Sciences.

Discussion

Cancers of the breast comprise a major public health concern with critical incidence, morbidity and mortality rates worldwide [1-3]. Triple negative breast cancer (TNBC) is a distinctive subgroup of breast cancers with a more aggressive disease course and poorer prognosis [4-6]. Unfortunately, both the disease itself and treatments used for management of TNBC may deteriorate quality of life with adverse events. For the time being, optimal management of TNBC may be achieved through combinations of treatment modalities including surgery, radiation therapy (RT), and systemic agents [4-6]. As for RT, several forms of irradiation could be utilized, and contemporary technologies including intensity modulation and adaptive RT techniques offer great potential for improved outcomes. While the use of higher effective doses may result in increased local control rates, toxicity profile of radiation delivery should be strongly considered for quality-of-life concerns.

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All patients have been treated by using contemporary RT techniques at Department of Radiation Oncology at Balikesir Atatürk Health and Application Center, University of Health Sciences. Optimal target definition and critical organ sparing may be considered among the pertinent aspects of RT in the millenium era. While definition of larger treatment volumes might result in excessive radiation induced toxicity, determination of smaller treatment volumes could ultimately lead to therapeutic failures. Adaptive RT strategies and multimodality imaging-based target definition were suggested to improve outcomes. In the current study, I documented tumor size changes following systemic treatment for TNBC. As the primary result, I found a considerable decrease in tumor sizes after systemic treatment for patients with TNBC. My findings might have implications for consideration of adaptive RT strategies for these patients; however, further studies are warranted to shed light on this critical issue.

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How to cite this article: Mustafa A. Assessment of Tumor Size Changes Following Systemic Therapy for Triple Negative Breast Cancer (TNBC). Canc Therapy & Oncol Int J. 2026; 31(1): 556305. DOI: 10.19080/CTOIJ.2025.31.556305

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DOI: 10.19080/CTOIJ.2025.31.556305

How to cite this article: Mustafa A. Assessment of Tumor Size Changes Following Systemic Therapy for Triple Negative Breast Cancer (TNBC). Canc Therapy & Oncol Int J. 2026; 31(1): 556305. DOI: 10.19080/CTOIJ.2025.31.556305