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

Research Article
Volume 26 Issue 4 - April 2024
DOI: 10.19080/CTOIJ.2024.25.556193

Cancer Ther Oncol Int J

Evaluation of Multimodality Imaging Based Treatment Volume Determination for Vulvar Squamous Cell Carcinoma (VSCC)

Selcuk Demiral*, Omer Sager, Ferrat Dincoglan and Murat Beyzadeoglu

Department of Radiation Oncology; University of Health Sciences, Gulhane Medical Faculty, Ankara, Turkey

Submission: March 19, 2024; **Published:** April 22, 2024

Corresponding author: Selcuk Demiral, University of Health Sciences, Gulhane Medical Faculty, Department of Radiation Oncology, Gn. Tevfik Saglam Cad, Etlik, Kecioren, Ankara / Turkey, Email: drs.demiral@hotmail.com

Abstract

Objective: Although accounting for a relatively smaller proportion of all cancers worldwide, vulvar squamous cell carcinoma (VSCC) presents a health concern among women. While surgery may play a critical role for successful management of VSCC, irradiation may serve as a complementary or alternative therapeutic strategy in certain circumstances. In this study, we aimed at evaluating treatment volume determination for VSCC with comparative assessment of CT and MRI.

Materials and methods: Ultimate endpoint of this study has been about treatment volume determination for VSCC with comparative assessment of CT and MRI. All included patients have been referred for RT at Department of Radiation Oncology at Gulhane Medical Faculty, University of Health Sciences for VSCC. We carried out a comparative analysis of treatment volume determination by CT simulation images for radiation treatment planning and with Magnetic Resonance Imaging (MRI).

Results: As the critical result of this study, we found that CT and MRI defined treatment volume determination resulted in differences. Within this context, fusion of CT and MRI was used for ground truth treatment volume definition.

Conclusion: In the current study, we found that CT and MRI defined treatment volume determination resulted in differences. Taking this into account, fusion of CT and MRI was utilized for ground truth treatment volume definition. These results may have implications for increased adoption of multimodality imaging for treatment volume determination of VSCC, however, validation in prospective clinical studies may be required.

Keywords: Vulvar squamous cell carcinoma /VSCC); Radiation therapy (RT); Target definition, Computed Tomography (CT); Magnetic Resonance Imaging (MRI)

Abbreviations: RT: Radiation Therapy; CT: Computed Tomography; MRI: Magnetic Resonance Imaging; VSCC: Vulvar Squamous Cell Carcinoma; EBRT: External Beam Radiation Therapy; SBRT: Stereotactic Body Radiation Therapy; IMRT: Intensity Modulated RT; ART: Adaptive RT (ART; LINAC: Linear Accelerator; AAPM: American Association of Physicists in Medicine; ICRU: International Commission on Radiation Units and Measurements

Introduction

Although accounting for a relatively smaller proportion of all cancers worldwide, vulvar squamous cell carcinoma (VSCC) presents a health concern among women [1-7]. Disease course typically depends on stage at diagnosis, and both the disease and treatment strategies utilized for management may deteriorate patients' quality of life. Surgical interventions, radiation therapy (RT), and systemic agents may be used for VSCC management [2-7]. In terms of irradiation, several forms including external beam radiation therapy (EBRT), Stereotactic Body Radiation Therapy (SBRT), and brachytherapy may be used according to patient, disease, and treatment characteristics. As a matter of fact, utilization of higher irradiation doses may contribute to improved local control outcomes for VSCC, however, toxicity profile of radiation delivery should be considered to avoid excessive radiation induced toxicity. Clearly, recent years have witnessed several advances in technology in the millenium era. Molecular imaging methods, Image Guided RT (IGRT), automatic segmentation techniques, Intensity Modulated RT (IMRT), stereotactic RT, and adaptive RT (ART) have been introduced for optimal radiotherapeutic management of patients [8-49]. Indeed, improved treatment results may solely be achieved through close collaboration among related disciplines for cancer management. Tumor boards may obviously contribute to bringing together surgical oncologists, radiation oncologists, medical oncologists, imaging and other relevant specialists to discuss about patient, tumor, and treatment characteristics. While surgery may play a critical role for successful management of VSCC, irradiation may serve as a complementary or alternative therapeutic strategy in certain circumstances. In this study, we aimed at evaluating treatment volume determination for VSCC with comparative assessment of CT and MRI.

Materials and Methods

Our clinic has long been treating a high patient population from several places from Turkey and abroad. Using state of the art irradiation techniques, several benign and malignant tumors were irradiated at our tertiary cancer center. The primary endpoint of this study has been about treatment volume determination for VSCC with comparative assessment of CT and MRI. All included patients have been referred for RT at Department of Radiation Oncology at Gulhane Medical Faculty, University of Health Sciences for VSCC. We carried out a comparative analysis of treatment volume determination by CT simulation images for radiation treatment planning and with Magnetic Resonance Imaging (MRI). CT simulations of the patients have been executed at CT-simulator (GE Lightspeed RT, GE Healthcare, Chalfont St. Giles, UK) available at our department. Also, MRI of patients have been acquired and used for comparative analysis. A Linear Accelerator (LINAC) with the capability of sophisticated IGRT techniques was utilized for irradiation. After rigid patient immobilization, planning CT images were acquired at CT-simulator for radiation treatment planning. Thereafter, acquired RT planning images were sent to the delineation workstation by use of the network. Treatment volumes and surrounding critical structures were defined on these images and structure sets were generated. Also, target definition was also performed on MRI for comparison. All patients were treated by using state of the art RT techniques at the Department of Radiation Oncology at Gulhane Medical Faculty, University of Health Sciences.

Results

Our study was primarily designed for assessment of treatment volume determination for VSCC with comparative evaluation of CT and MRI. Irradiation procedures were performed 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, radiation oncology, and medical oncology.

We have considered the reports by American Association of Physicists in Medicine (AAPM) and International Commission on Radiation Units and Measurements (ICRU) for accurate radiation treatment planning. Radiation physicists took part in generation of radiation treatment plans by considering the relevant critical organ dose constraints by meticulous consideration of contemporary guidelines and clinical experience. Also, the published international guidelines and consensus recommendations for RT contouring and treatment of vulvar carcinoma were considered [7]. Tissue heterogeneity, electron density, CT number and HU values in CT images were also considered by radiation physicists for accurate radiation treatment planning. Primary objective of radiation treatment planning was to achieve optimal treatment volume coverage without violation of critical organ dose constraints. IGRT techniques including kilovoltage cone beam CT and electronic digital portal imaging were utilized, and radiation treatment has been performed by Synergy (Elekta, UK) LINAC. As the critical result of this study, we found that CT and MRI defined treatment volume determination resulted in differences. Within this context, fusion of CT and MRI was used for ground truth treatment volume definition.

Discussion

While accounting for a relatively smaller proportion of all cancers worldwide, VSCC presents a health concern among women [1-7]. Disease course typically depends on stage at diagnosis, and both the disease and treatment strategies utilized for management may deteriorate patients' quality of life. Surgical interventions, RT, and systemic agents may be used for VSCC management [2-7]. In terms of irradiation, several forms including EBRT, SBRT, and brachytherapy may be used according to patient, disease, and treatment characteristics. As a matter of fact, utilization of higher irradiation doses may contribute to improved local control outcomes for VSCC, however, toxicity profile of radiation delivery should be taken into account to avoid excessive radiation induced toxicity. Clearly, recent years have witnessed several advances in technology in the millenium era. Molecular imaging methods, IGRT, automatic segmentation techniques, IMRT, stereotactic RT, and ART have been introduced for optimal radiotherapeutic management of patients [8-49]. Indeed, improved treatment results may solely be achieved through close collaboration among related disciplines for cancer management. Tumor boards may obviously contribute to bringing together surgical oncologists, radiation oncologists, medical oncologists, imaging and other relevant specialists to discuss about patient, tumor, and treatment characteristics. While surgery may play a critical role for successful management of VSCC, irradiation may serve as a complementary or alternative therapeutic strategy in certain circumstances. In this study, we aimed at evaluating treatment volume determination for VSCC with comparative assessment of CT and MRI.

Our clinic has long been treating a high patient population from several places from Turkey and abroad. Using state of the

How to cite this article: Selcuk Demiral*, Omer Sager, Ferrat Dincoglan, Murat Beyzadeoglu. Evaluation of Multimodality Imaging Based Treatment Volume Determination for Vulvar Squamous Cell Carcinoma (VSCC). Canc Therapy & Oncol Int J. 2024; 26(4): 556193. DOI: 10.19080/CTOIJ.2024.25.556193

art irradiation techniques, several benign and malignant tumors were irradiated at our tertiary cancer center. Primary endpoint of this study was about treatment volume determination for VSCC with comparative assessment of CT and MRI. All included patients have been referred for RT at Department of Radiation Oncology at Gulhane Medical Faculty, University of Health Sciences for VSCC. We carried out a comparative analysis of treatment volume determination by CT simulation images for radiation treatment planning and with MRI. CT simulations of the patients have been executed at CT-simulator (GE Lightspeed RT, GE Healthcare, Chalfont St. Giles, UK) available at our department. Also, MRI of patients have been acquired and used for comparative analysis.

A LINAC with the capability of sophisticated IGRT techniques was utilized for irradiation. After rigid patient immobilization, planning CT images were acquired at CT-simulator for radiation treatment planning. Thereafter, acquired RT planning images were sent to the delineation workstation by use of the network. Treatment volumes and surrounding critical structures were defined on these images and structure sets were generated. Also, target definition was also performed on MRI for comparison. All patients were treated by using state of the art RT techniques at the Department of Radiation Oncology at Gulhane Medical Faculty, University of Health Sciences.

Our study was primarily designed for assessment of treatment volume determination for VSCC with comparative evaluation of CT and MRI. Irradiation procedures were performed 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, radiation oncology, and medical oncology. We have taken into account the reports by AAPM and ICRU for accurate radiation treatment planning. Radiation physicists took part in generation of radiation treatment plans by considering the relevant critical organ dose constraints by meticulous consideration of contemporary guidelines and clinical experience. Also, the published international guidelines and consensus recommendations for RT contouring and treatment of vulvar carcinoma were considered [7]. Tissue heterogeneity, electron density, CT number and HU values in CT images were also considered by radiation physicists for accurate radiation treatment planning. Primary objective of radiation treatment planning was to achieve optimal treatment volume coverage without violation of critical organ dose constraints. IGRT techniques including kilovoltage cone beam CT and electronic digital portal imaging were utilized, and radiation treatment has been performed by Synergy (Elekta, UK) LINAC. As the critical result of this study, we found that CT and MRI defined treatment volume determination resulted in differences. Within this context, fusion of CT and MRI was used for ground truth treatment volume definition.

From the perspective of radiation oncology, optimal treatment volume determination and normal tissue sparing may be considered among the critical components of optimal radiotherapeutic management. While determination of larger treatment volumes might result in excessive radiation induced toxicity, definition of smaller treatment volumes may lead to treatment failures. Adaptive RT strategies and multimodality imaging-based target definition have been suggested for achieving improved outcomes [50-104]. In the current study, we found that CT and MRI defined treatment volume determination resulted in differences. Taking this into account, fusion of CT and MRI was utilized for ground truth treatment volume definition. These results may have implications for increased adoption of multimodality imaging for treatment volume determination of VSCC, however, validation in prospective clinical studies may be required.

References

1. Siegel RL, Giaquinto AN, Jemal A (2024) Cancer statistics, 2024. CA Cancer J Clin 74(1): 12-49.
2. Oonk MHM, Planchamp F, Baldwin P, Mahner S, Mirza MR, et al. (2023) European Society of Gynaecological Oncology Guidelines for the Management of Patients with Vulvar Cancer - Update 2023. Int J Gynecol Cancer 33(7): 1023-1043.
3. Macchia G, Lancellotta V, Ferioli M, Casà C, Pezzulla D, et al. (2024) Definitive chemoradiation in vulvar squamous cell carcinoma: outcome and toxicity from an observational multicenter Italian study on vulvar cancer (OLDLADY 1.1). Radiol Med 129(1): 152-159.
4. Abuhijla F, Salah S, Al-Hussaini M, Mohamed I, Jaradat I, et al. (2020) Factors influencing the use of adaptive radiation therapy in vulvar carcinoma. Rep Pract Oncol Radiother 25(5): 709-713.
5. Sciacero P, Cante D, Piva C, Casanova Borca V, et al. (2017) The role of radiation therapy in vulvar cancer: review of the current literature. Tumori. 103(5): 422-429.
6. Sharma DN (2012) Radiation in vulvar cancer. Curr Opin Obstet Gynecol 24(1): 24-30.
7. Gaffney DK, King B, Viswanathan AN, Barkati M, Beriwal S, et al. (2016) Consensus Recommendations for Radiation Therapy Contouring and Treatment of Vulvar Carcinoma. Int J Radiat Oncol Biol Phys 95(4): 1191-1200.
8. Sager O, Dincoglan F, Demiral S, Uysal B, Gamsiz H, et al. (2023) Adaptive radiation therapy (art) for patients with limited-stage small cell lung cancer (LS-SCLC): A dosimetric evaluation. Indian J Cancer 60(1): 140-147.
9. Gamsiz H, Sager O, Uysal B, Dincoglan F, Demiral S, et al. (2023) Outcomes of Sterotactic Body Radiotherapy (SBRT) for pelvic lymph node recurrences after adjuvant or primary radiotherapy for prostate cancer. J Cancer Res Ther 19(Suppl 2): S851-S856.
10. Gamsiz H, Sager O, Uysal B, Dincoglan F, Demiral S, et al. (2022) Active breathing control guided stereotactic body ablative radiotherapy for management of liver metastases from colorectal cancer. Acta Gastroenterol Belg 85(3): 469-475.
11. Sager O, Dincoglan F, Demiral S, Uysal B, Gamsiz H, et al. (2022) Concise review of radiosurgery for contemporary management of pilocytic astrocytomas in children and adults. World J Exp Med 12(3): 36-43.

How to cite this article: Selcuk Demiral*, Omer Sager, Ferrat Dincoglan, Murat Beyzadeoglu. Evaluation of Multimodality Imaging Based Treatment Volume Determination for Vulvar Squamous Cell Carcinoma (VSCC). Canc Therapy & Oncol Int J. 2024; 26(4): 556193. DOI: 10.19080/CTOIJ.2024.25.556193

12. Sager O, Dincoglan F, Demiral S, Gamsiz H, Uysal B, et al. (2022) Optimal timing of thoracic irradiation for limited stage small cell lung cancer: Current evidence and future prospects. World J Clin Oncol 13(2): 116-124.

13. Demiral S, Sager O, Dincoglan F, Uysal B, Gamsiz H, et al. (2021) Evaluation of breathing-adapted radiation therapy for right-sided early-stage breast cancer patients. Indian J Cancer 58(2): 195-200.

14. Sager O, Dincoglan F, Demiral S, Uysal B, Gamsiz H, et al. (2021) Omission of Radiation Therapy (RT) for Metaplastic Breast Cancer (MBC): A Review Article. International Journal of Research Studies in Medical and Health Sciences 6: 10-15.

15. Sager O, Dincoglan F, Demiral S, Uysal B, Gamsiz H, et al. (2021) Concise review of stereotactic irradiation for pediatric glial neoplasms: Current concepts and future directions. World J Methodol 11(3): 61-74.

16. Sager O, Dincoglan F, Demiral S, Uysal B, Gamsiz H, et al. (2020) Adaptive radiation therapy of breast cancer by repeated imaging during irradiation. World J Radiol 12(5): 68-75.

17. Sager O, Beyzadeoglu M, Dincoglan F, Demiral S, Gamsiz H, et al. (2020) Multimodality management of cavernous sinus meningiomas with less extensive surgery followed by subsequent irradiation: Implications for an improved toxicity profile. J Surg Surgical Res 6: 56-61.

18. Beyzadeoglu M, Sager O, Dincoglan F, Demiral S, Uysal B, et al. (2020) Single Fraction Stereotactic Radiosurgery (SRS) versus Fractionated Stereotactic Radiotherapy (FSRT) for Vestibular Schwannoma (VS). J Surg Surgical Res 6: 62-66.

19. Dincoglan F, Beyzadeoglu M, Sager O, Demiral S, Uysal B, et al. (2020) A Concise Review of Irradiation for Temporal Bone Chemodectomas (TBC). Arch Otolaryngol Rhinol 6: 16-20.

20. Sager O, Dincoglan F, Demiral S, Uysal B, Gamsiz H, et al. (2019) Utility of Molecular Imaging with 2-Deoxy-2-[Fluorine-18] Fluoro-DGlucose Positron Emission Tomography (18F-FDG PET) for Small Cell Lung Cancer (SCLC): A Radiation Oncology Perspective. Curr Radiopharm 12(1): 4-10.

21. Dincoglan F, Sager O, Demiral S, Gamsiz H, Uysal B, et al. (2019) Fractionated stereotactic radiosurgery for locally recurrent brain metastases after failed stereotactic radiosurgery. Indian J Cancer 56(2): 151-156.

22. Sager O, Dincoglan F, Demiral S, Uysal B, Gamsiz H, et al. (2019) Breathing adapted radiation therapy for leukemia relapse in the breast: A case report. World J Clin Oncol 10(11): 369-374.

23. Dincoglan F, Sager O, Uysal B, Demiral S, Gamsiz H, et al. (2019) Evaluation of hypofractionated stereotactic radiotherapy (HFSRT) to the resection cavity after surgical resection of brain metastases: A single center experience. Indian J Cancer 56(3): 202-206.

24. Sager O, Dincoglan F, Uysal B, Demiral S, Gamsiz H, et al. (2018) Evaluation of adaptive radiotherapy (ART) by use of replanning the tumor bed boost with repeated computed tomography (CT) simulation after whole breast irradiation (WBI) for breast cancer patients having clinically evident seroma. Jpn J Radiol 36(6): 401-406.

25. Demiral S, Dincoglan F, Sager O, Uysal B, Gamsiz H, et al. (2018) Contemporary Management of Meningiomas with Radiosurgery. Int J Radiol Imaging Technol 80: 187-190.

26. Sager O, Dincoglan F, Uysal B, Demiral S, Gamsiz H, et al. (2017) Splenic Irradiation: A Concise Review of the Literature. J App Hem Bl Tran 1: 101.

27. Dincoglan F, Sager O, Demiral S, Uysal B, Gamsiz H, et al. (2017) Radiosurgery for recurrent glioblastoma: A review article. Neurol Disord Therap 1: 1-5.

28. Demiral S, Dincoglan F, Sager O, Gamsiz H, Uysal B, et al. (2016) Hypofractionated stereotactic radiotherapy (HFSRT) for who grade I anterior clinoid meningiomas (ACM). Jpn J Radiol 34(11): 730-737.

29. Dincoglan F, Beyzadeoglu M, Sager O, Demiral S, Gamsiz H, et al. (2015) Management of patients with recurrent glioblastoma using hypofractionated stereotactic radiotherapy. Tumori 101(2): 179-184.

30. Gamsiz H, Beyzadeoglu M, Sager O, Demiral S, Dincoglan F, et al. (2015) Evaluation of stereotactic body radiation therapy in the management of adrenal metastases from non-small cell lung cancer. Tumori 101(1): 98-103.

31. Sager O, Beyzadeoglu M, Dincoglan F, Demiral S, Uysal B, et al. (2015) Adaptive splenic radiotherapy for symptomatic splenomegaly management in myeloproliferative disorders. Tumori 101(1): 84-90.

32. Sager O, Dincoglan F, Beyzadeoglu M (2015) Stereotactic radiosurgery of glomus jugulare tumors: Current concepts, recent advances and future perspectives. CNS Oncol 4(2): 105-114.

33. Sager O, Beyzadeoglu M, Dincoglan F, Uysal B, Gamsiz H, et al. (2014) Evaluation of linear accelerator (LINAC)-based stereotactic radiosurgery (SRS) for cerebral cavernous malformations: A 15-year single-center experience. Ann Saudi Med 34(1): 54-58.

34. Demiral S, Beyzadeoglu M, Sager O, Dincoglan F, Gamsiz H, et al. (2014) Evaluation of Linear Accelerator (Linac)-Based Stereotactic Radiosurgery (Srs) for the Treatment of Craniopharyngiomas. UHOD-Uluslararasi Hematoloji Onkoloji Dergisi 24(2): 123-129.

35. Sager O, Beyzadeoglu M, Dincoglan F, Gamsiz H, Demiral S, et al. (2014) Evaluation of linear accelerator-based stereotactic radiosurgery in the management of glomus jugulare tumors. Tumori 100(2): 184-188.

36. Ozsavaş EE, Telatar Z, Dirican B, Sager O, Beyzadeoğlu M (2014) Automatic segmentation of anatomical structures from CT scans of thorax for RTP. Comput Math Methods Med 2014: 472890.

37. Demiral S, Beyzadeoglu M, Sager O, Dincoglan F, Gamsiz H, et al. (2014) Evaluation of linear accelerator (linac)-based stereotactic radiosurgery (srs) for the treatment of craniopharyngiomas. UHOD - Uluslararasi Hematoloji-Onkoloji Dergisi 24: 123-129.

38. Gamsiz H, Beyzadeoglu M, Sager O, Dincoglan F, Demiral S, et al. (2014) Management of pulmonary oligometastases by stereotactic body radiotherapy. Tumori 100(2): 179-183.

39. Dincoglan F, Sager O, Gamsiz H, Uysal B, Demiral S, et al. (2014) Management of patients with ≥ 4 brain metastases using stereotactic radiosurgery boost after whole brain irradiation. Tumori 100(3): 302-306.

40. Sager O, Beyzadeoglu M, Dincoglan F, Demiral S, Uysal B, et al. (2013) Management of vestibular schwannomas with linear accelerator-based stereotactic radiosurgery: a single center experience. Tumori 99(5): 617-622.

41. Dincoglan F, Beyzadeoglu M, Sager O, Uysal B, Demiral S, et al. (2013) Evaluation of linear accelerator-based stereotactic radiosurgery in the management of meningiomas: A single center experience. J BUON 18(3): 717-722.

42. Dincoglan F, Beyzadeoglu M, Sager O, Oysul K, Kahya YE, et al. (2013) Dosimetric evaluation of critical organs at risk in mastectomized left-sided breast cancer radiotherapy using breath-hold technique. Tumori 99(1): 76-82.

43. Demiral S, Beyzadeoglu M, Uysal B, Oysul K, Kahya YE, et al. (2013) Evaluation of stereotactic body radiotherapy (SBRT) boost in the management of endometrial cancer. Neoplasma 60(3): 322-327.

44. Sager O, Beyzadeoglu M, Dincoglan F, Oysul K, Kahya YE, et al. (2012) Evaluation of active breathing control-moderate deep inspiration breath-hold in definitive non-small cell lung cancer radiotherapy. Neoplasma 59(3): 333-340.

How to cite this article: Selcuk Demiral*, Omer Sager, Ferrat Dincoglan, Murat Beyzadeoglu. Evaluation of Multimodality Imaging Based Treatment Volume Determination for Vulvar Squamous Cell Carcinoma (VSCC). Canc Therapy & Oncol Int J. 2024; 26(4): 556193. DOI: 10.19080/CTOIJ.2024.25.556193

45. Sağer Ö, Dinçoğlan F, Gamsiz H, Demiral S, Uysal B, et al. (2012) Evaluation of the impact of integrated [18f]-fluoro-2-deoxy-D-glucose positron emission tomography/computed tomography imaging on staging and radiotherapy treatment volume definition of nonsmall cell lung cancer. Gulhane Med J 54: 220-227.

46. Sager O, Beyzadeoglu M, Dincoglan F, Oysul K, Kahya YE, et al. (2012) The Role of Active Breathing Control-Moderate Deep Inspiration Breath-Hold (ABC-mDIBH) Usage in non-Mastectomized Left-sided Breast Cancer Radiotherapy: A Dosimetric Evaluation UHOD - Uluslararasi Hematoloji-Onkoloji Dergisi 22: 147-155.

47. Dincoglan F, Sager O, Gamsiz H, Uysal B, Demiral S, et al. (2012) Stereotactic radiosurgery for intracranial tumors: A single center experience. Gulhane Med J 54: 190-198.

48. Dincoglan F, Beyzadeoglu M, Sager O, Oysul K, Sirin S et al. (2012) Image-guided positioning in intracranial non-invasive stereotactic radiosurgery for the treatment of brain metastasis. Tumori 98(5): 630-635.

49. Sirin S, Oysul K, Surenkok S, Sager O, Dincoglan F, et al. (2011) Linear accelerator-based stereotactic radiosurgery in recurrent glioblastoma: A single center experience. Vojnosanit Pregl 68(11): 961-966.

50. Demiral S, Sager O, Dincoglan F, Uysal B, Gamsiz H, et al. (2018) Evaluation of Target Volume Determination for Single Session Stereotactic Radiosurgery (SRS) of Brain Metastases. Canc Therapy & Oncol Int J 12: 555848.

51. Beyzadeoglu M, Sager O, Dincoglan F, Demiral S (2019) Evaluation of Target Definition for Stereotactic Reirradiation of Recurrent Glioblastoma. Arch Can Res 7(1): 3.

52. Sager O, Dincoglan F, Demiral S, Gamsiz H, Uysal B, et al. (2019) Evaluation of the Impact of Magnetic Resonance Imaging (MRI) on Gross Tumor Volume (GTV) Definition for Radiation Treatment Planning (RTP) of Inoperable High Grade Gliomas (HGGs). Concepts in Magnetic Resonance Part A.

53. Sager O, Dincoglan F, Demiral S, Gamsiz H, Uysal B, et al. (2019) Utility of Magnetic Resonance Imaging (Imaging) in Target Volume Definition for Radiosurgery of Acoustic Neuromas. Int J Cancer Clin Res 6: 119.

54. Demiral S, Sager O, Dincoglan F, Beyzadeoglu M (2019) Assessment of Computed Tomography (CT) And Magnetic Resonance Imaging (MRI) Based Radiosurgery Treatment Planning for Pituitary Adenomas. Canc Therapy & Oncol Int J 13: 555857.

55. Dincoglan F, Sager O, Demiral S, Beyzadeoglu M (2019) Multimodality Imaging for Radiosurgical Management of Arteriovenous Malformations. Asian J Pharm Nurs Med Sci 7(1): 7-12.

56. Sager O, Dincoglan F, Demiral S, Beyzadeoglu M (2019) Evaluation of Radiosurgery Target Volume Determination for Meningiomas Based on Computed Tomography (CT) And Magnetic Resonance Imaging (MRI). Cancer Sci Res Open Access 5: 1-4.

57. Demiral S, Sager O, Dincoglan F, Beyzadeoglu M (2019) Assessment of target definition based on Multimodality imaging for radiosurgical Management of glomus jugulare tumors (GJTs). Canc Therapy & Oncol Int J 15: 555909.

58. Dincoglan F, Sager O, Demiral S, Beyzadeoglu M (2019) Incorporation of Multimodality Imaging in Radiosurgery Planning for Craniopharyngiomas: An Original Article. SAJ Cancer Sci 6: 103.

59. Beyzadeoglu M, Dincoglan F, Demiral S, Sager O (2020) Target Volume Determination for Precise Radiation Therapy (RT) of Central Neurocytoma: An Original Article. Int J Res Stud Med & Health Sci 5: 29-34.

60. Dincoglan F, Demiral S, Sager O, Beyzadeoglu M (2020) Utility of Multimodality Imaging Based Target Volume Definition for Radiosurgery of Trigeminal Neuralgia: An Original Article. Biomed J Sci & Tech Res 26: 19728-19732.

61. Demiral S, Beyzadeoglu M, Dincoglan F, Sager O (2020) Assessment of Target Volume Definition for Radiosurgery of Atypical Meningiomas with Multimodality Imaging. J Hematol & Oncol Res 3: 14-21.

62. Dincoglan F, Beyzadeoglu M, Demiral S, Sager O (2020) Assessment of Treatment Volume Definition for Irradiation of Spinal Ependymomas: An Original Article. ARC J Cancer Sci 6: 1-6.

63. Sager O, Demiral S, Dincoglan F, Beyzadeoglu M (2020) Target Volume Definition for Stereotactic Radiosurgery (SRS) Of Cerebral Cavernous Malformations (CCMs). Canc Therapy & Oncol Int J 15: 555917.

64. Sager O, Dincoglan F, Demiral S, Beyzadeoglu M (2020) Treatment Volume Determination for Irradiation of Recurrent Nasopharyngeal Carcinoma with Multimodality Imaging: An Original Article. ARC J Cancer Sci 6: 18-23.

65. Sager O, Dincoglan F, Demiral S, Beyzadeoglu M (2020) Assessment of Target Volume Definition for Irradiation of Hemangiopericytomas: An Original Article. Canc Therapy & Oncol Int J 17(2): 555959.

66. Sager O, Dincoglan F, Demiral S, Beyzadeoglu M (2020) Evaluation of Treatment Volume Determination for Irradiation of chordoma: an Original Article. Int J Res Stud Med & Health Sci 5(10): 3-8

67. Demiral S, Dincoglan F, Sager O, Beyzadeoglu M (2020) Multimodality Imaging Based Target Definition of Cervical Lymph Nodes in Precise Limited Field Radiation Therapy (Lfrt) for Nodular Lymphocyte Predominant Hodgkin Lymphoma (Nlphl). ARC J Cancer Sci 6: 6-11.

68. Sager O, Dincoglan F, Demiral S, Beyzadeoglu M (2020) Radiosurgery Treatment Volume Determination for Brain Lymphomas with and without Incorporation of Multimodality Imaging. J Med Pharma Allied Sci 9: 2398-2404.

69. Beyzadeoglu M, Dincoglan F, Sager O, Demiral S (2020) Determination of Radiosurgery Treatment Volume for Intracranial Germ Cell Tumors (GCTS). Asian J PharmNurs & Med Sci 8(3): 18-23.

70. Dincoglan F, Sager O, Demiral S, Beyzadeoglu M (2020) Target Definition of orbital Embryonal Rhabdomyosarcoma (Rms) by Multimodality Imaging: An Original Article. ARC J Cancer Sci 6: 12-17.

71. Sager O, Dincoglan F, Demiral S, Beyzadeoglu M (2020) Evaluation of Target Volume Determination for Irradiatıon of Pilocytic Astrocytomas: An Original Article. ARC J Cancer Sci 6: 1-5.

72. Demiral S, Beyzadeoglu M, Dincoglan F, Sager O (2020) Evaluation of Radiosurgery Target Volume Definition for Tectal Gliomas with Incorporation of Magnetic Resonance Imaging (MRI): An Original Article. Biomed J Sci & Tech Res (BJSTR) 27: 20543-20547.

73. Demiral S, Dincoglan F, Sager O, Beyzadeoglu M (2021) Assessment of Multimodality Imaging for Target Definition of Intracranial Chondrosarcomas. Canc Therapy Oncol Int J 18(2): 555981.

74. Dincoglan F, Sager O, Demiral S, Beyzadeoglu M (2021) Impact of Multimodality Imaging to Improve Radiation Therapy (RT) Target Volume Definition for Malignant Peripheral Nerve Sheath Tumor (MPNST). Biomed J Sci Tech Res 34: 26734-26738.

75. Sager O, Demiral S, Dincoglan F, Beyzadeoglu M (2021) Multimodality Imaging Based Treatment Volume Definition for Reirradiation of Recurrent Small Cell Lung Cancer (SCLC). Arch Can Res 9: 1-5.

76. Demiral S, Sager O, Dincoglan F, Beyzadeoglu M (2021) Radiation Therapy (RT) Target Volume Definition for Peripheral Primitive Neuroectodermal Tumor (PPNET) by Use of Multimodality Imaging: An Original Article. Biomed J Sci & Tech Res 34: 26970-26974.

How to cite this article: Selcuk Demiral*, Omer Sager, Ferrat Dincoglan, Murat Beyzadeoglu. Evaluation of Multimodality Imaging Based Treatment Volume Determination for Vulvar Squamous Cell Carcinoma (VSCC). Canc Therapy & Oncol Int J. 2024; 26(4): 556193. DOI: 10.19080/CTOIJ.2024.25.556193

77. Dincoglan F, Demiral S, Sager O, Beyzadeoglu M (2021) Evaluation of Target Definition for Management of Myxoid Liposarcoma (MLS) with Neoadjuvant Radiation Therapy (RT). Biomed J Sci Tech Res 33: 26171-26174.

78. Sager O, Dincoglan F, Demiral S, Beyzadeoglu M (2021) Radiation Therapy (RT) target determination for irradiation of bone metastases with soft tissue component: Impact of multimodality imaging. J Surg Surgical Res 7: 42-46.

79. Sager O, Dincoglan F, Demiral S, Beyzadeoglu M (2021) Evaluation of Changes in Tumor Volume Following Upfront Chemotherapy for Locally Advanced Non-Small Cell Lung Cancer (NSCLC). Glob J Cancer Ther 7: 31-34.

80. Sager O, Demiral S, Dincoglan F, Beyzadeoglu M (2021) Assessment of posterior fossa target definition by multimodality imaging for patients with medulloblastoma. J Surg Surgical Res 7: 37-41.

81. Dincoglan F, Sager O, Demiral S, Beyzadeoglu M (2021) Assessment of the role of multimodality imaging for treatment volume definition of intracranial ependymal tumors: An original article. Glob J Cancer Ther 7: 43-45.

82. Beyzadeoglu M, Demiral S, Dincoglan F, Sager O (2022) Assessment of Target Definition for Extramedullary Soft Tissue Plasmacytoma: Use of Multımodalıty Imaging for Improved Targetıng Accuracy. Canc Therapy & Oncol Int J 22(4): 556095.

83. Dincoglan F, Sager O, Demiral S, Beyzadeoglu M (2022) Target Volume Determination for Recurrent Uterine Carcinosarcoma: An Original Research Article Revisiting the Utility of Multimodality Imaging. Canc Therapy & Oncol Int J 22(3): 556090.

84. Demiral S, Sager O, Dincoglan F, Beyzadeoglu M (2022) Reappraisal of Computed Tomography (CT) And Magnetic Resonance Imaging (MRI) Based Target Definition for Radiotherapeutic Management of Recurrent Anal Squamous Cell Carcinoma (ASCC): An Original Article. Canc Therapy & Oncol Int J 22(2): 556085.

85. Demiral S, Dincoglan F, Sager O, Beyzadeoglu M (2022) An Original Article for Assessment of Multimodality Imaging Based Precise Radiation Therapy (Rt) in the Management of Recurrent Pancreatic Cancers. Canc Therapy & Oncol Int J 22(1): 556078.

86. Sager O, Demiral S, Dincoglan F, Beyzadeoglu M (2022) Assessment of Target Volume Definition for Precise Radiotherapeutic Management of Locally Recurrent Biliary Tract Cancers: An Original Research Article. Biomed J Sci & Tech Res 46(1): 37054-37059.

87. Sager O, Demiral S, Dincoglan F, Beyzadeoglu M. (2022) Radiation Therapy (RT) Target Volume Determination for Locally Advanced Pyriform Sinus Carcinoma: An Original Research Article Revisiting the Role of Multimodality Imaging. Biomed J Sci & Tech Res 45(1): 36155-36160.

88. Demiral S, Sager O, Dincoglan F, Beyzadeoglu M (2022) Improved Target Volume Definition for Radiotherapeutic Management of Parotid Gland Cancers by use of Multimodality Imaging: An Original Article. Canc Therapy & Oncol Int J 21(3): 556062.

89. Beyzadeoglu M, Sager O, Demiral S, Dincoglan F (2022) Reappraisal of multimodality imaging for improved Radiation Therapy (RT) target volume determination of recurrent Oral Squamous Cell Carcinoma (OSCC): An original article. J Surg Surgical Res 8(1): 4-8.

90. Dincoglan F, Sager O, Demiral S, Beyzadeoglu M (2022) Multimodality imaging-based treatment volume definition for recurrent Rhabdomyosarcomas of the head and neck region: An original article. J Surg Surgical Res 8(2): 013-018.

91. Dincoglan F, Demiral S, Sager O, Beyzadeoglu M (2022) Appraisal of Target Definition for Management of Paraspinal Ewing Tumors with Modern Radiation Therapy (RT): An Original Article. Biomed J Sci & Tech Res 44(4): 35691-35696.

92. Beyzadeoglu M, Sager O, Demiral S, Dincoglan F (2022) Assessment of Target Volume Definition for Contemporary Radiotherapeutic Management of Retroperitoneal Sarcoma: An Original Article. Biomed J Sci & Tech Res 44(5): 35883-35887.

93. Dincoglan F, Sager O, Demiral S, Beyzadeoglu M (2023) Appraisal of Target Definition for Anaplastic Thyroid Carcinoma (ATC): An Original Article Addressing the Utility of Multimodality Imaging. Canc Therapy & Oncol Int J 24(4): 556143.

94. Demiral S, Dincoglan F, Sager O, Beyzadeoglu M (2023) Reappraisal of Treatment Volume Determination for Parametrial Boosting in Patients with Locally Advanced Cervical Cancer. Canc Therapy & Oncol Int J 24(5): 556148.

95. Demiral S, Sager O, Dincoglan F, Beyzadeoglu M (2023) Tumor Size Changes after Neoadjuvant Systemic Therapy for Advanced Oropharyngeal Squamous Cell Carcinoma. Canc Therapy & Oncol Int J 24(5): 556147.

96. Demiral S, Dincoglan F, Sager O, Beyzadeoglu M (2023) Assessment of Changes in Tumor Volume Following Chemotherapy for Nodular Sclerosıng Hodgkin Lymphoma (NSHL). Canc Therapy & Oncol Int J 24(5): 556146.

97. Sager O, Demiral S, Dincoglan F, Beyzadeoglu M (2023) Evaluation of Volumetric Changes in Transglottic Laryngeal Cancers After Induction Chemotherapy. Biomed J Sci & Tech Res 51(4): 43026-43031.

98. Dincoglan F, Sager O, Demiral S, Beyzadeoglu M (2023) An Original Research Article for Evaluation of Changes in Tumor Size After Neoadjuvant Chemotherapy in Borderline Resectable Pancreatic Ductal Adenocarcinoma. Biomed J Sci & Tech Res 52(1): 43253-43255.

99. Sager O, Dincoglan F, Demiral S, Beyzadeoglu M (2023) Assessment of Tumor Size Changes After Neoadjuvant Chemotherapy in Locally Advanced Esophageal Cancer: An Original Article. Biomed J Sci & Tech Res 52(2): 43491-43493.

100. Beyzadeoglu M, Demiral S, Dincoglan F, Sager O (2023) Evaluation of Target Definition for Radiotherapeutic Management of Recurrent Merkel Cell Carcinoma (MCC). Canc Therapy & Oncol Int J 24(2): 556133.

101. Dincoglan F, Demiral S, Sager O, Beyzadeoglu M (2023) Reappraisal of Treatment Volume Determination for Recurrent Gastroesophageal Junction Carcinoma (GJC). Biomed J Sci & Tech Res 50(5): 42061-42066.

102. Beyzadeoglu M, Dincoglan F, Demiral S, Sager O (2023) An Original Article Revisiting the Utility of Multimodality Imagıng for Refıned Target Volume Determinatıon Of Recurrent Kidney Carcinoma. Canc Therapy & Oncol Int J 23(5): 556122.

103. Beyzadeoglu M, Demiral S, Dincoglan F, Sager O (2023) Appraisal of Target Definition for Recurrent Cancers of the Supralottic Larynx. Biomed J Sci & Tech Res 50 (5): 42131-42136.

104. Beyzadeoglu M, Demiral S, Dincoglan F, Sager O (2024) Reappraisal of Target Definition for Sacrococcygeal Chordoma: Comparative Assessment with Computed Tomography (CT) and Magnetic Resonance Imaging (MRI. Biomed J Sci & Tech Res 55(1): 46686-46692.

How to cite this article: Selcuk Demiral*, Omer Sager, Ferrat Dincoglan, Murat Beyzadeoglu. Evaluation of Multimodality Imaging Based Treatment Volume Determination for Vulvar Squamous Cell Carcinoma (VSCC). Canc Therapy & Oncol Int J. 2024; 26(4): 556193. DOI: 10.19080/CTOIJ.2024.25.556193

DOI: 10.19080/CTOIJ.2024.25.556193

How to cite this article: Selcuk Demiral*, Omer Sager, Ferrat Dincoglan, Murat Beyzadeoglu. Evaluation of Multimodality Imaging Based Treatment Volume Determination for Vulvar Squamous Cell Carcinoma (VSCC). Canc Therapy & Oncol Int J. 2024; 26(4): 556193. DOI: 10.19080/CTOIJ.2024.25.556193