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Original Research Article

Gynecological Malignancy for IMRT Target Volume Delineation and Comparison with Slicer Radionomics

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Abstract:

Purpose: The present study is to compare CT, MRI image based Slicer Radionomics software target volume delineation for gynaecological malignancies and evaluated précis target volume extraction for IMRT treatments.

Material & Methods: To solve advanced image extraction algorithms numerous modules are available among that slicer radionomics is an extension of 3D slicer, that processes a variety of image formats which was used to evaluate gynecological cancer IMRT treatment tumor volume margins. These target volume dimension values were compared with TPS volume, and the variation in delineation volume is analyzed by comparing both modalities target volume value.

Results: Radionomics PTV provides an exact target volume margin for radiation treatment.

Conclusion: This result may further be revisited by prospective post radiotherapy imaging to confirm enough margins for tumor control, further the patient set up errors needs to be incorporated during treatment execution to reproduce an exact PTV margin.

Keywords: PTV- planning Tumor volume, IMRT- intensity modulated radiotherapy. TPS – treatment planning system.

Introduction

Radionomics has ability to compute patient treatment images acquired at various imaging modalities, the development of image sequence modalities and analysis have led to medical innovation by improvement in computer hardware and software [1].

For radiotherapy planning we require diagnostic images such as CT, MRI, PET, scan for tumor delineation. Recently a novel medical imaging analysis named radionomics[2] has been proposed to play an increasing role in radiation treatment for target volume extraction process .

It is widely known that individual response of different tumors depends on various planning tumor volume margins for tumor control[3].

Materials & Methods

To solve advanced image extraction algorithms numerous modules are available among them slicer radionomics is an extension for 3D slicer, that incorporates variety of radionomics features by adopting different slicer extension managers and various filters combinations to extract an exact application for particular study[4], we adopted change filter to extract IMRT

delineation for volume extraction process to extract tumor volume alone. It is considered application of slicer radionomics in radiotherapy particularly gynecological malignancies; radiotherapy plays an important role in treatment of endometrial, cervical cancers. It is associated with Chemotherapy, EBRT, Brachytherapy for cervical cancers staged FIGO stage IB – IVA[5]. The present study considered IMRT cases to evaluate exact tumor volume delineation by adopting slicer radionomics. The images from CT, MRI and Treatment planning systems were subjected to target volume extraction by computing with different types of image extension manager filters software system.

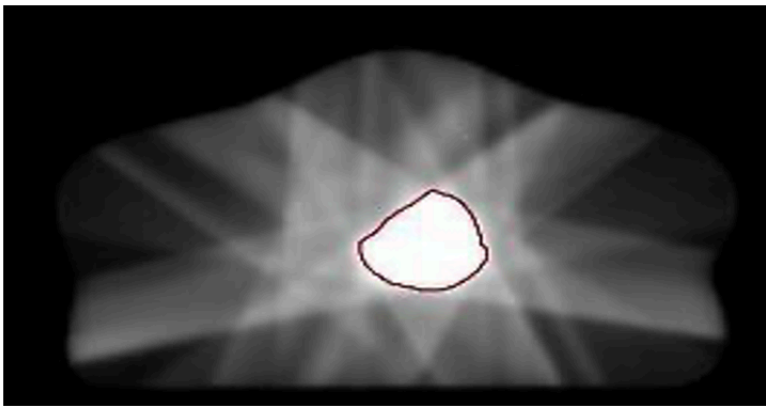

Figure 1: Slicer radionomics PTV Transverse

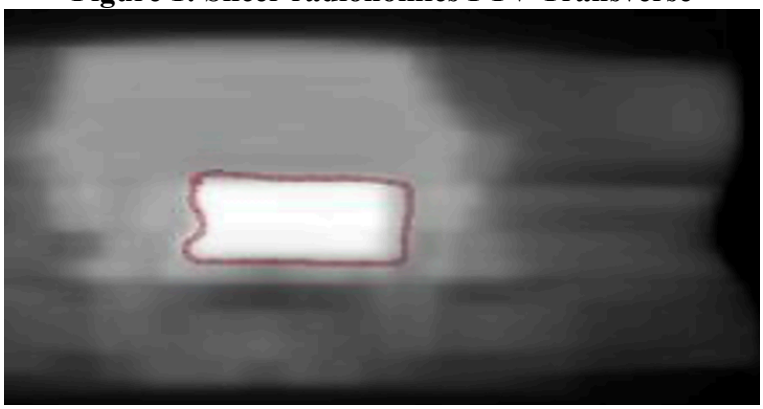

Figure 2: Slicer radionomics coronal PTV

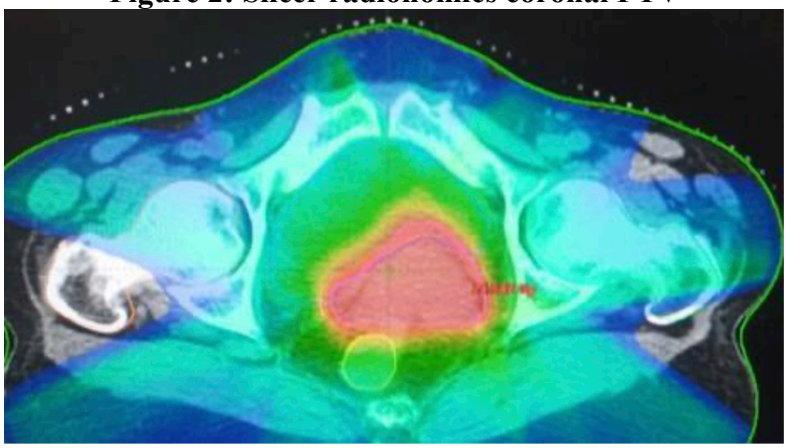

Figure 3: IMRT transverse PTV

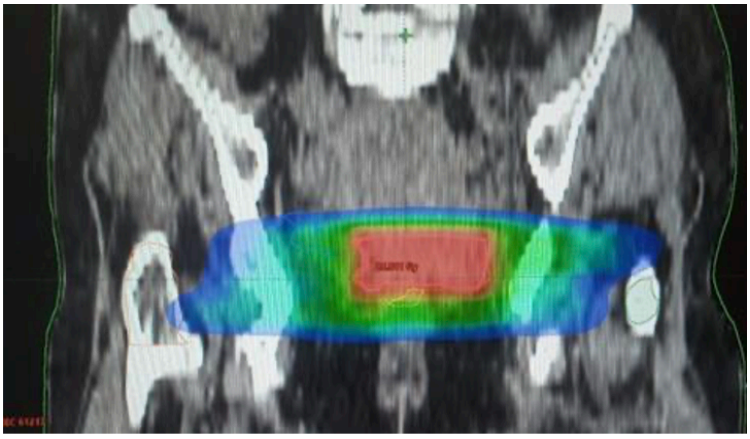

Figure 4: coronal PTV

The image extension manager model change filter we used to acquire 3D images from slicer radionomics, tumor volume has been noted for comparison with initial tumor volume available in TPS data. The PTV provides an exact target volume for radiation treatment, these target volume dimension values are compared with radionomics image extension manager, the image provided target volume value and difference in delineation volume is analyzed by comparing all modalities target volume value.

Discussion

The radionomics PTV delineation from fig.1 and 2 compared with treatment planning system PTV delineation, let us consider PTV cubic volumes harvested from radionomic and TPS values 825.2cc and 828.3cc, respectively there is a variation between two images PTV value. Various recommendation available to delineate tumor volume, however post planning volume is considered for effective radiation treatment[6] from these comparative study of both images provides an extra margin has been given 0.5mm for overall tumor volume, they are continuously receiving radiation dose to normal tumor volume and surrounding the tumour, therefore subtraction of radionomics based tumor volume alone leads to modify over all delineation margins, on other hand the late tumor recurrence is controlled. Radionomic prediction supports comparing tumor volume PTV delineation decision making systems.

Conclusion

In comparison to radionomics and TPS shows the PTV margins for IMRT gynecological cancers subtracted anatomy and radiation beam tumor volume alone, there is a delineation margin difference from TPS 825.2cm^3 and Radionomics 828.3cm^3, This margins can be further extended to 0.5 mm. Radionomics algorithm reconstructed PTV alone to evaluate precise Target volume[7]. This result may be further revisited by prospective post radiotherapy imaging to confirm enough margin for tumor control, further the patient set up during treatment execution reproduces exact dose coverage to target volume.

Reference

1. GuliB, Micco M, valentine AL, cambi f, Pasciuto T, Testa A, etal.. Prospective multimodal imaging assessment locally advanced cervical cancers patients administered by chemoradiation followed by radical surgery-the “PRICE “ study 2: role of conventional and DW-MRI. Eur Radiol 2019;29:309-
2. Zwanenburg,et al ,The image biomarker standardization initiative: Standardized quantitative radiomics for high-throughput image-based pheno-

typing. Radiology, 295(2)2020;328-338.
3. SM.Bentzen, HD. Thames, et al, Tumour and local control probability clinical data and radiobiological interpretations International Journal of Radiation Oncology Biol, Phys.36(1) 1996:247-251.
4. Luciamanganaro, Gabriele maria Nicolino, et al, Radiomics in cervical and Endometrial cancer. The British Institute of Radiology.2021; 99:1125.
5. Lambin P, Rios-Velazquez E, Leijenaar R, Carvalho S, van Stiphout RG, Granton P, Zegers CM, Gillies R, Boellard R, Dekker A, Aerts HJ (2012) Radiomics: extracting more information from medical images using advanced feature analysis. Eur J Cancer 48(4):441–446.
6. Gardin I, Gregoire V, Gibon D, Kirisli H, Pasquier D, Thariat J, et al. Radiomics: principles and radiotherapy applications. Crit Rev Oncol Hematol. (2019) 138:44–50.
7. Lambin, P. et al. Radiomics: The bridge between medical imaging and personalized medicine. Nat. Rev. Clin. Oncol. 14, 749–762 (2017).