Medical and Research Publications
International Open Access

Review Article **Journal of MAR Oncology (Volume 3 Issue 3)**

Analysis of Ptv Margins for Pelvic Radiotherapy: Experience from a Tertiary Care Hospital in Western India

Dr. Sarthak Moharir[1], Dr. Rahul Misra[2], Dr. Rakesh Jadhav[3], Mr. A Karthik [4], Mr. Ram Reddy [5]

1. Junior consultant Radiation Oncology HCG Cancer Centre Vadodara

2. Director, Radiation Oncology, HCG cancer center, vadodara

3. Consultant Radiation Oncology HCG Cancer Centre Vadodara

4. RSO Department of Radiation Oncology HCG Cancer Centre Vadodara

5. Chief Radiotherapy Technologist HCG Cancer Centre Vadodara

Corresponding Author: Dr. Sarthak Moharir, Junior consultant Radiation Oncology HCG Cancer Centre Vadodara

Received Date: January 24, 2022

Published Date: February 02, 2022

Introduction:

Pelvic Radiotherapy treatments are usually given over a period of 4-6 weeks by 20-28 fractions. In the era of high dose conformity, the need for high accuracy in setup margins is also required. There are high chances of daily setup variations ultimately lowering the precision and accuracy of treatment. To lower this error radiotherapy is delivered with proper immobilisation and setup errors are accounted for by creating PTV or Planning target volume, which is created by adding setup margin to CTV or clinical Target volume which is the area with high disease burden (either gross or microscopic). Wrong or unmatched PTV margins may also result in target miss. Hence, it is essential for every institute to

evaluate and analyze their setup error. This will give more accurate margins and CTV to PTV ratios. An effective way of producing geometrical margins is by statistical models, which allow for reduction in margin sizes and which are smaller but effective in tumor control. Usually, these setup margins are population-based margins and are assigned according to disease site viz. Cervix, Rectum, Prostate etc. it is usually kept at 5 mm. However, it is imperative that each department verifies its own setup margins to ensure proper precision and accuracy of treatment. This is necessary to ensure proper delivery of accurate treatment.

Objective: To evaluate if the PTV margins given as per the population-based margins are sufficient enough to cover all setup errors in the Pelvic Malignancy patients treated in our department.

Methodology

Design of the study is retrospective. 50 Patients that underwent radiation for pelvic malignancies (Cervix, Prostate, Rectum, Endometrium, etc) with daily CBCT imaging protocol, from March 2020 to March 2021 were utilised for the purpose of the study.

Daily shift in set up in X,Y,Z directions before treatment was recorded in table form for the entire duration of treatment.

Once all data had been recorded, Van Herk Formula and Stroom formula were used to calculate population based PTV margins. Patient population characteristics are given in table 1

sex	MALE	38
	FEMALE	12
Treatment intent	RADICAL	27
	ADJUVANT	14
	NEO-ADJVANT	9
SUBSITE DISTRIBUTION	CERVIX/ENDOMETRIUM	12
	RECTUM	9
	PROSTATE	29

The Van Herk Formula and Stroom formula were used to calculate population-based margins

Observations:

1. The average setup margins were 0.48 cm in X axis, 0.50 cm in Y axis and 0.44 cm in the Y axis as calculated by the Van Herk formula.

2. The average setup margins were 0.42 cm in X axis, 0.43 cm in Y axis and 0.38 cm in the Z axis as calculated by the Stroom formula.

• By both the formulas viz . Van Herk and stroom formulas the setup margins in all the three axes (x,y,z) were in tune with the population based margins of 0.5 cm which were used in the department.

• Thus the current margins applied for setup errors are well within the safety range to offer precise and accurate treatment to the patients.

Review of literature:

• Setup errors are created in radiotherapy treatment setup by a variety of causes. This depends upon the anatomical site receiving radiotherapy and the setup quality of the institute, including, but not limited to the accurate matching of laser markers, type of immobilization device used, poor patient setup, resolution of the kV imaging, plus accurate matching of the DRR to the kV images and CBCT to the planning CT before beginning of treatment. In addition to this, both inaccuracy in the position of the bony structures (patient setup) and unknown internal target motion relative to the bony anatomy contribute to the uncertainty in the target position during irradiation.

• Excess PTV margins may translate to extra dose to the sigmoid colon, small bowel, rectum and bladder. The toxicity of small bowel is the limiting factor in whole pelvic radiotherapy, leading to diarrhea, nausea, malabsorbtion and pain abdomen Population based margins for PTV, can be as much as 40mm and can result in large volumes of OARs getting irradiated. Since financial constraints play a major role in deciding quality of care in India, choosing a centre specific, and individualized PTV margins, which limits the bowel and bladder toxicity in patients where daily imaging is not available, are essential for ensuring quality care.

Discussion:

• By both the formulas viz . Van Herk and stroom formulas the setup margins in all the three axes (x,y,z) were in tune with the population based margins of 0.5 cm which were used in our department. Thus the current margins applied for setup errors are well within the safety range to offer precise and accurate treatment to the patients.

• The current practice of applying setup margins of 0.5 cm from CTV to PTV should be continued to offer precise and accurate treatment to the patients. Similar audits should be conducted for other subsites like Thorax and Brain to ensure that precise and accurate treatment is being delivered to all patients. It should be ensured that strict simulation and immobilisation protocols continued to be followed so that the current standard of care can be maintained.

References

1. Rabinowitz I, Broomberg J, Goitein M, McCarthy K, Leong J. Accuracy of radiation field alignment in clinical practice. Int J Radiat Oncol Biol Phys 1985;11:1857-67.

2. Khan, A., Jensen, L., Sun, S., Song, W., Yashar, C., Mundt, A., Zhang, F., Jiang, S. and Mell, L. (2012). Optimized Planning Target Volume for Intact Cervical Cancer. International Journal of Radiation Oncology*Biology*Physics, 83(5), pp.1500-1505.

3. Huddart RA, Nahum A, Neal A,. Accuracy of pelvic radiotherapy: prospective analysis of 90 patients in a randomised trial of blocked versus standard radiotherapy. Radiother Oncol 1996;39:19± 29.

4. Yilmaz C, Gultekin M, Eren G, Yuce D, Yildiz F. Determination of optimal planning target volume margins in patients with gynecological cancer. Physica Medica. 2015;31(7):708-713.