Dosimetric benefit of additional oblique needles through an add-on-cap to Vienna-I ring applicator for cervical tumors with lateral parametrial disease.

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Abstract

Background and Purpose: A newly designed, add on cap template which fits to the commercially available Vienna ring applicator allows for additional oblique needles in the lateral parametrium. Here we report a dosimetric comparison of the advanced Vienna Brachytherapy (BT) application utilizing the oblique needles (Vienna-II) as compared to Vienna Application without utilizing the oblique needles (Vienna-I).

Methods: A total of 30 cervical cancer patients treated with Vienna-II advanced BT Application between Jan 2011 and Dec 2016 were analyzed. All patients were delivered with 45-50 Gy of EBRT followed by 2 BT applications to a dose of 21-28 Gy in 3-4 fractions prescribed to High Risk CTV (HR-CTV). The EBRT and BT doses were normalized to EQD2 and compiled. Three dimensional treatment planning based on MRI (n=27)/CT (n=3) imaging was done. The planning principles included standard loading pattern for the intracavitary applicator with stepwise dwell weight adaptation and needle loading optimization (maximum 20% of intracavitary contribution) to achieve an optimal target

coverage and organ at risk (OAR) sparing. Optimized plans of Vienna-I application loading only parallel needles were generated retrospectively at a reasonably similar OAR doses to achieve optimum target doses. The resultant DVH parameters of target coverage and OAR's were compared to the treated Vienna-II plan.

Results: The mean (±SD) HRCTV volume was 63 ± 20 cm^3. The mean (±SD) needles loaded in Vienna-I and Vienna-II plan were 5 (±1) and 8 (±2), respectively. The total oblique needles used were 3 (±2), while the mean depth of needle insertion was 4.5 (±0.2) cm. Significant differences for Vienna-II as compared to Vienna-I plans were derived for dose application to the target volume; HR-CTV, D98 was 75±7 Gy Vs. 65±6 Gy (p=<0.001) and D90 was 85±9 Gy Vs. 74±9 Gy (p=<0.001). On the contrary, mean ± SD 2cm^3 doses to OAR's were similar for bladder: 89±11 Gy Vs. 84±12 Gy (p=<0.001), rectum: 71±7 Gy Vs. 69±7 Gy (p=<0.001) and sigmoid: 70±10 Gy Vs. 68±10 Gy (p=<0.001). An absolute dosimetric gain of 11 Gy to target volume was achieved with comparable doses to OAR.

Conclusions: The Vienna-II BT application using additional oblique needles allows for better target doses with optimal sparing of OAR's in cervical tumors with persistent lateral parametrial disease at the time of BT.

Biography

Dr. Pushpa Naga C.H, MD, DNB (Radiation Oncology)

Education & Training:

- MBBS completed in 2010; MD (Radiation Oncology) in 2014 from RGUHS university, Bangalore and DNB (Radiation Oncology) of National Board, Delhi, India in 2016.
- Perused advanced training in Radiation Oncology as Senior resident at Tata Memorial Hospital, Mumbai, a premier tertiary cancer centre in India for 2 years (Aug 2014-July 2016).
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Academic and Research publications

- Have nine indexed full-article publications and seventeen conferences abstracts published in indexed scientific journals.

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