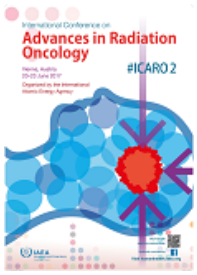

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Low dose-rate prostate brachytherapy: do different seeds manufacturers matters?

Wednesday, 21 June 2017 15:35 (5 minutes)

Introduction:
Prostate cancer is the most common cancer in males, excluding non-melanoma skin cancers. Clinical presentation is variable and the disease is classified as having low, intermediate or high-risk. The main modalities of treatment are radical prostatectomy (RP), brachytherapy (BT), and external beam radiation therapy (EBRT), with or without androgen deprivation. Brachytherapy is a treatment option with the same efficacy as EBRT or RP alone in patients with newly diagnosed low- or intermediate-risk prostate. In Brazil, there are few centers (23) performing low dose rate (LDR) BT, using about 25,000 seeds/year. We started our program at the Hospital Sírio-Libanês (HSL) in 1998 and currently we have already treated 1043 patients with LDR BT.
The source description in the planning system has an important role for the treatment, because the source geometries, including encapsulation and internal structure leads us to use different parameters of dose rate constants, radial dose and anisotropy functions.
AAPM Recommendations Regarding Clinical calibration of seeds, ask for calibration of at least 10% of the seeds prior to the implant, for every implant. Clinical calibration agreement with manufacturer should be within 3% of batch mean and 5% maximum deviation from mean.
For the past 18 years, this was the procedure at HSL using the OncoSeed® 6711, produced by Amersham using Well Chamber (Standard Imaging HDr Plus) with calibration factor for 6711 seeds model. In March 2016, after a government motion, all the centers performing LDR BT started to use Best® seeds model 2301, for the first time in the country.
When performing the clinical calibration of this new seed, a difference of 17%, between the certificated one and our measurement was observed. At this time we were using the same dosimetry system. In Brazil there is no Accredited Laboratory and no possibility to obtain the calibration factor for Iodine-125 seeds Best model 2301.
In addition, the dose calculations for treatment were generated by the Variseed® treatment planning system (TPS) using the parameters of the two sources and the dose distribution was different between them.
The objectives of this study were to determine the correct calibration factor of our well chamber for the Best 2301 seeds and to determine the clinical source calibration of these seeds; to evaluate the interchangeability of the two commercially available 125I sources by assessing the dosimetric effect in the implant dose distribution and how this affects our daily practice.

Methodology:
Three sources with different activities : 0.502 mCi , 1.001 mCi . and 1.194 mCi were sent to Instituto de Pesquisas Energéticas e Nucleares (IPEN) by Best Company. The seeds were calibrated by National Institute of Standards and Technology (NIST). With the known sources activities, we performed cross-calibration measurements and the new calibration factor was set for our well chamber. Calculations using the available sources geometries, radial dose functions and anisotropy distributions were performed with both manufacturers'seeds and the results were compared. The Variseed TPS was used for calculations.
Results: The dose-volume histogram generated for each manufacturer showed marked differences mainly in the high-dose regions.
The measured difference in the calibration for the two sources was 17%. Using this new factor, a difference of only 1 to 3% between the certified value and our calibration was observed.
When comparing the dose distribution in the volume receiving 100% of the prescribed dose, differences of up to 10% mainly in the high dose region within the implant were observed.The reason of this can be explained

by source geometries differences, including encapsulation and internal structure leads to different parameters of dose rate constants, radial dose and anisotropy functions .
Conclusions:
Chamber calibration factor for the specific manufacturer is necessary for the clinical source calibration and In the absence of an Accredited Laboratory , like in Brazil, the cross-calibration measurements is a reasonable solution.
The dose distribution for two source designs presented important differences mainly in the volume within the internal high-dose regions and may affect the dose received by non-target internal sites .
A simple interchangeability of sources from different manufacturers is not recommended without the appropriate clinical calibration and dosimetric evaluation.

Country

Brazil

Institution

Hospital Sirio Libanes

Primary author: HADDAD, Cecilia Maria Kalil (Sirio Libanes Hospital)

Co-authors: PELOSI, Edilson (Hospital Sirio Libanes); LEITE, Elton (Hosp. Sirio Libanes); SILVA, João Luis (Hosp. Sirio Libanes)

Presenter: HADDAD, Cecilia Maria Kalil (Sirio Libanes Hospital)

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