Impact of magnetic resonance imaging and transrectal ultrasound fusion in the dosimetry of cT3a prostate cancer patients treated with real time HDR brachytherapy

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Purpose. Transrectal Ultrasound (TRUS) image is not an accurate tool to identify the presence of Extracapsular Extension (ECE). Multiparametric MRI has by far the best spatial resolution and yields unsurpassed anatomic images of the prostate. The purpose of this study was to evaluate the impact of intraoperative MRI/TRUS fusion procedure in cT3a prostate cancer patients treated with HDR real time brachytherapy.
Material and methods. Prostate gland, Dominant Intraprostatic Lesions (DILs) and ECE were delineated in the pre-brachytherapy MRI of 10 consecutive patients by two experienced uro-radiologists. Two virtual treatment plannings were performed based on the MRI/TRUS fusion images, one considering the ECE volume and the second excluding it. The homogeneity parameters used for optimization aim were: prostate V100 > 98%, V150 of 25–33%, urethral < 115% and rectal 1 cm^3 < 70% of prescribed dose. The implant parameters and dose-volume histogram (DVH) related parameters of the prostate, OARs and ECE were compared between both plans.
Results. The median prostate volume was 23.4 cm^3 (19–35), median number of needles 16 (13–17) for both plans. Median radial distance of ECE was 3.4 mm (2.0–5.4) No significant differences were found between prostate V100, V150, V200 and OARs DVH related parameters. Values of ECE V150 and V200 were significantly higher in the dosimetric plan when considering the presence of ECE ($p = 0.002$ and $p = 0.004$, respectively) and there was a trend toward significance for ECE V100 ($p = 0.06$). Only one patient in the ECE group required an additional needle to get an optimal prostate dosimetry. To our knowledge this is the first study reporting the dosimetric impact of TRUS/MRI fusion in the coverage of ECE in T3a patients treated with HDR real time brachytherapy.
Conclusions. TRUS/MRI fusion provides important information for prostate brachytherapy, allowing for better coverage and higher doses to the ECE region in patients with clinical stage T3a.

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Implementation of partial breast irradiation

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Introduction. In the last years, accelerated partial breast irradiation (APBI) has been included in protocols of good clinical practice and recommendations of scientific societies. This is the case of ASTRO or GEC-ESTRO, which issued these recommendations after a thorough review of the literature, chief among them being the proper selection of patients to be treated. This includes patients with the following characteristics: $T < 2$ cm, free surgical margins, no extensive intraductal component, ductal carcinoma, no lymphovascular invasion, negative nodes and age > 60.
Objective. To present the procedure performed in our center for the implementation of APBI with high-dose-rate brachytherapy (HDR).
Materials and methods. After an exhaustive review of the literature, we decided to implement APBI in our department in the time a patient entered into the recommended clinical indications. The technique involves performing a mammary implant with flexible tubing. These are placed in the patient using a needle and fixed with a few buttons and friction washers. We administered 32 Gy/8 sessions/4 Gy, twice daily, 6 h apart. Once the implant, the patient underwent a CT, with cuts every 2 mm, and rebuilt the implant in the planning system (Brachytherapy Planning, version 10.0.39.Varian Medical Systems). All measurements were performed by the Department of Radiophysics. We took into account: Dmax skin, Dmax lung, V90, V100, V150, V200, D90, D100, Vref, V5 Gy lung, DHI, COIN and CI (conformity index).
Results. 93.7% of the dose covers 90% of the PTV. The CI (0.96) gives a good idea of the adequate volume coverage. Lung and skin dose is within the values obtained in the literature. Excellent tolerance.
Conclusion. Accelerated partial breast irradiation has shown to be a reasonable alternative to conventional irradiation after conservative surgery in selected patients. These benefits are quantified in cost-effectiveness, comfort by reducing overall treatment time and decreased likelihood of secondary effects on adjacent organs.

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