

First Experiences with Dynamic Interactive Realtime Dose Verification during Transperineal Permanent Seedimplantation (TPSI) of Patients with “Low Risk” Prostate Cancer in an Outpatient Setting



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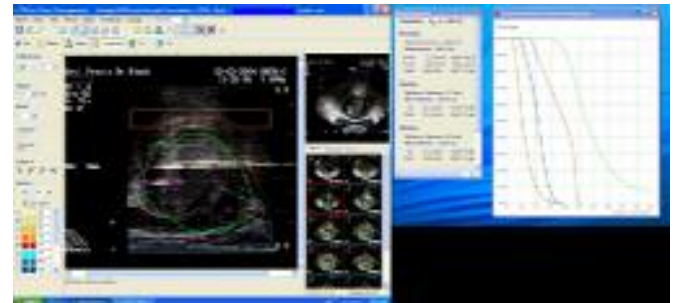
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Introduction:

This study evaluates the recently introduced dynamic interactive realtime verification of dose distribution during TPSI of patients with “low risk” prostate cancer (PCa cT1-2 Gleason Score 2-6 iPSA <10 ng/ml) in order to analyse if realtime calculation can improve postimplant dose distribution. It is well known from other series that D90 >140 Gy results in a high percentage of patients with long time PSA recurrence free survival.

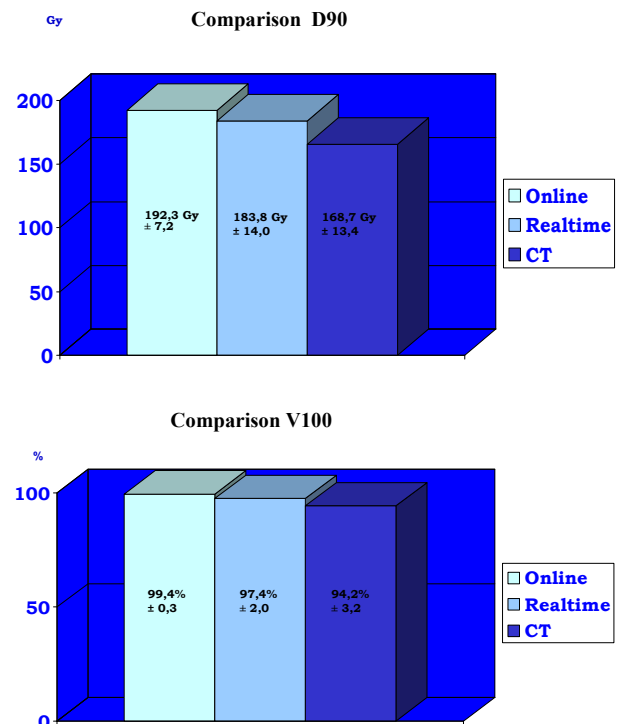
Patients/Method:

62 patients (66.4 ± 7.1 years) were treated with TPSI (125-I-RAPID Strands® 0.552-0.737 mCi) because of low risk prostate cancer according to the recommendations of ABS, ESTRO and EORTC. Planning procedures were performed as: Online-Planning (prescription dose 145 Gy, D90 >180 Gy, V100 >98%, minimal dose at the surface of the prostate >120 Gy, D1 and D30 urethra <230 Gy and <215 Gy respectively, D10 anterior rectal wall ≤ 145 Gy, dosimetry software: VariSeed 7.0 (n=45) and PSID 3.5 (n=17)). During realtime dose verification the TRUS-shown position image of each needle was transferred immediately into the planning system before releasing the seeds.



Virtual Overlapping of Implantation Needle and Seeds with immediate Dose Calculation

Results:



Interactive dynamic dose verification

The needle position could be corrected according to the virtually overlapped position. The dose distribution was recalculated before the next needle with seeds were implanted. Consecutively the critical dose criteria were calculated real time. Each patient underwent a CT based postplanning procedure 30 days after TPSI.

Conclusions:

Dynamic interactive realtime dose verification allows excellent quality control during the complete TPSI. If necessary, additional seeds can be added in order to improve the dose distribution. In the CT postplanning procedure this technique lead to D90 and V100 of >150 Gy and >90% respectively.

TRUS- and CT-„Image Fusion“ in the Postplanning Procedure after Transperineal Permanent Interstitial Seedimplantation (TPSI) of “Low Risk” Prostate Cancer



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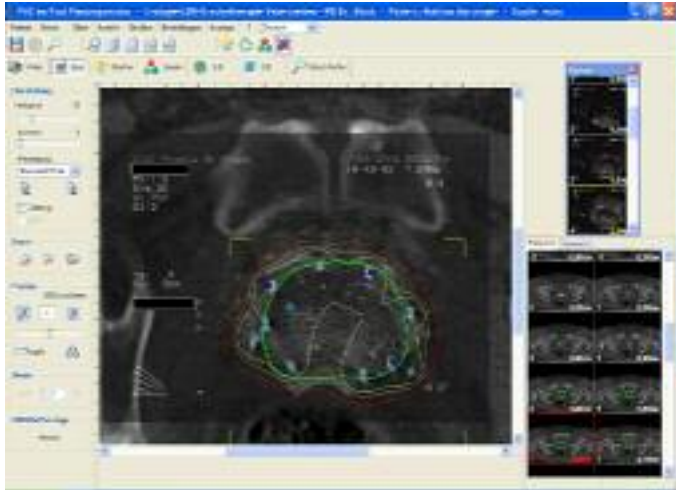
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Introduction:

In the CT-scan it is difficult to determine the prostate volume exactly, especially in the apical and basal regions. Therefore, the fusion of CT scans (identification of seeds) with TRUS images (determination of prostate volume) were examined 30 days after TPSI in order to analyse the reliability of the postplanning procedure.

Patients/Method:

30 patients (66,9±7,0 years) underwent TPSI (125-I-RAPID Strands®) because of low risk prostate cancer (cT1-2 Gleason Score <7 iPSA <10 ng/ml). 30 days after TPSI a CT scan and a TRUS-volumetry (5 mm increments, lithotomy position) were performed. After calibration CT- and TRUS-images were overlapped (dosimetry-software: PSID 3.5). During image-fusion the first orientation was carried out at the pubic arch and further on at the seminal vesicles, special seed locations and central prostate regions.

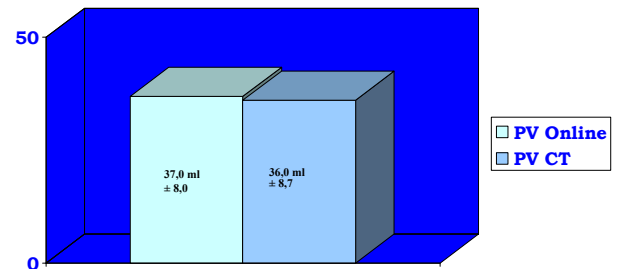


CT-/TRUS-Image Fusion

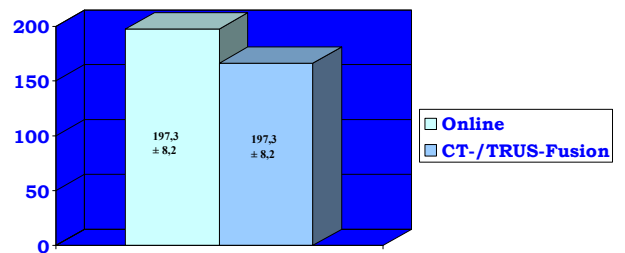
Histogram Data			
Target Dose: $R_x = 145$ Gy			
Prostata			
Total Volume: 44.5 cm ³			
Minimum Dose: 64.6 Gy			
V100	41.9 cm ³	94.2 Vol. %	
V150	35.4 cm ³	79.4 Vol. %	
D90	173.5 Gy	119.7 % Rx	

Results:

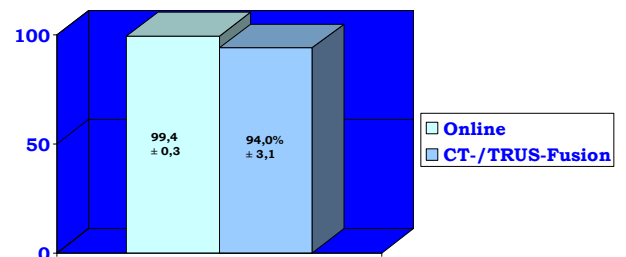
Prostate volume (ml)



D90 (Gy)



V 100 (%)



Conclusions:

The fusion of CT- and TRUS-images did not lead to a significant change of prostate volume at day 30 after TPSI. But, however, differences of D90 and V100 were found in the online- and fusion-planning. This is due to altered anatomy structures in CT- and TRUS-examination (pressure of the ultrasound probe on anterior rectal wall). This technique allows a reliable postplanning procedure after TPSI and is less expensive than MRT-image fusion.