

PROPOSED SOLUTION TO IMPROVE THE PROTECTION OF RECTUM IN VMAT PROSTATE TREATMENTS

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PURPOSE

Volumetric modulated arc therapy (VMAT) is a technique widely used in prostate treatment cancer nowadays, which decreases the delivery time and the dose in the organs at risk. The goal of this work is to achieve a higher dose gradient between the PTV and the rectum, meanwhile, decrease the optimization time in our treatment planning system (TPS).

MATERIALS AND METHODS

Our TPS is Eclipse (Varian Medical System, Palo Alto, California). The VMAT optimizer is Progressive Resolution Optimizer (PRO v13.06.26) and the calculation algorithm is Anisotropic Analytical Algorithm (AAA v13.06.26). Instead the initial state of the multileaf collimator (MLC) given by the optimizer, we try to find one more adapted to the organs delimited by the physician. To obtain this initial state, an arc therapy treatment was generated fitting the MLC to the PTV in the Beam's Eye View (BEV) with a 5 mm of margin and protecting the rectum without margin, as well. We propose to use this arc therapy plan as an initial plan when optimization starts and only perform the last stages of VMAT optimization, assigning only to the objectives of the PTV and the bladder.

RESULTS

Our group has used this method for more than 20 concomitant and single volume treatments. We have compared the results of our method with those obtained by the usual method of optimization. In both cases, we delivered the dose with a single arc. The coverage of the PTV is similar in both solutions, but the protection of the rectum in low and medium doses is notably better with our technique (See Fig.1 and Fig.2). The MLC transitions between adjacent gantry angles become smoother using our solution. The differences between the dose to the bladder and to the femoral heads in both methods are not remarkable. The time used to perform an optimization with the new technique is significantly lower.

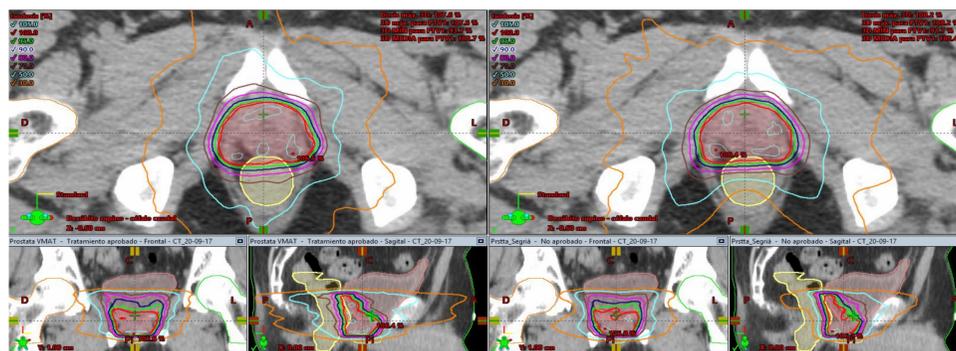


Fig 1: Views in the Plan Evaluation space of Eclipse to compare both distributions in the three orthogonal views. The left is the distribution with VMAT and the right is the distribution with our solution. Rectum is coloured in yellow and bladder in pink.

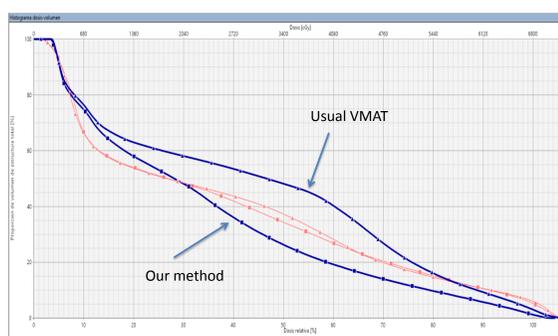


Fig 2: Dose - Volum Histogram comparison. It is clear that our solution is better in almost the entire dose range, especially in the low and medium dose range.

CONCLUSIONS

The proposed method increases the protection of the rectum in prostate treatments, decreases the optimization time and simplifies the table of restrictions in the optimizer.



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A.Forner HUAV

A.Otal_The black man HUAV

C.Monfà_La mare del Tano de Linyola HUAV

O.Ripol_The X Factor HUAV

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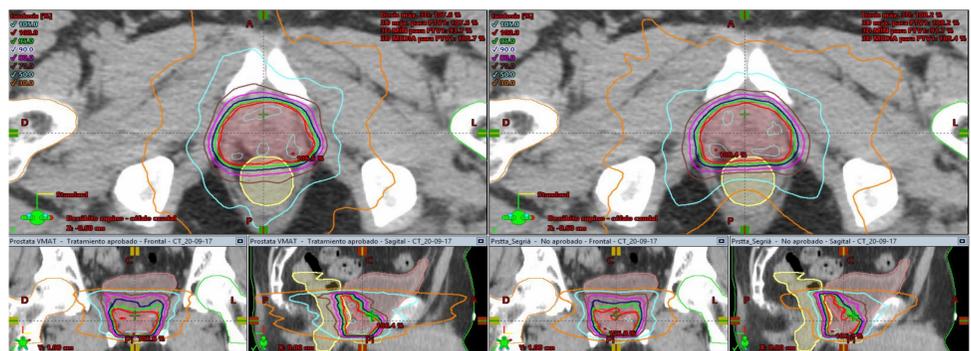


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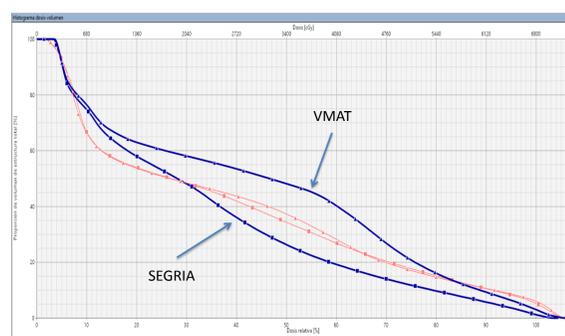


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