Retrospective analysis of volumetric modulated arc therapy treatments: correlation between plans complexity and dosimetric accuracy.

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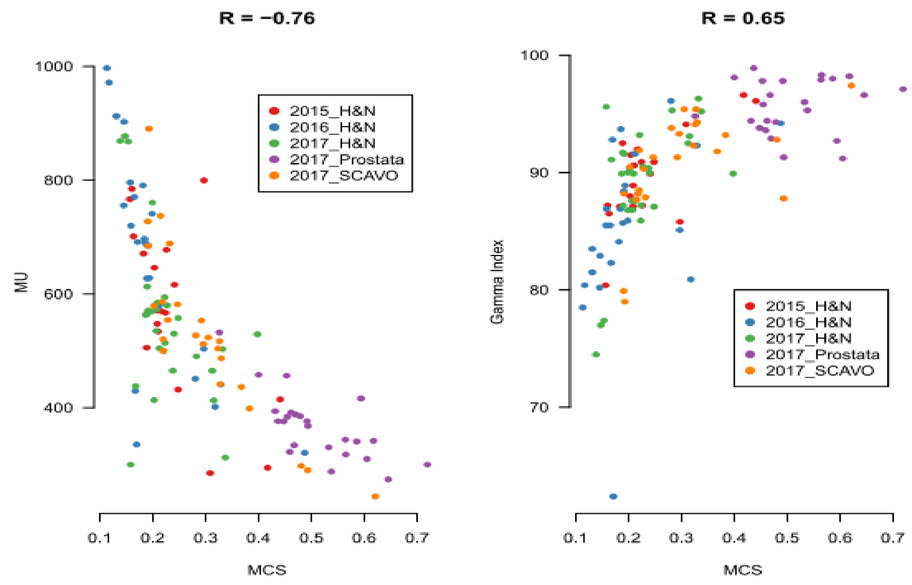
A retrospective analysis of VMAT treatments delivered in our center since 2015

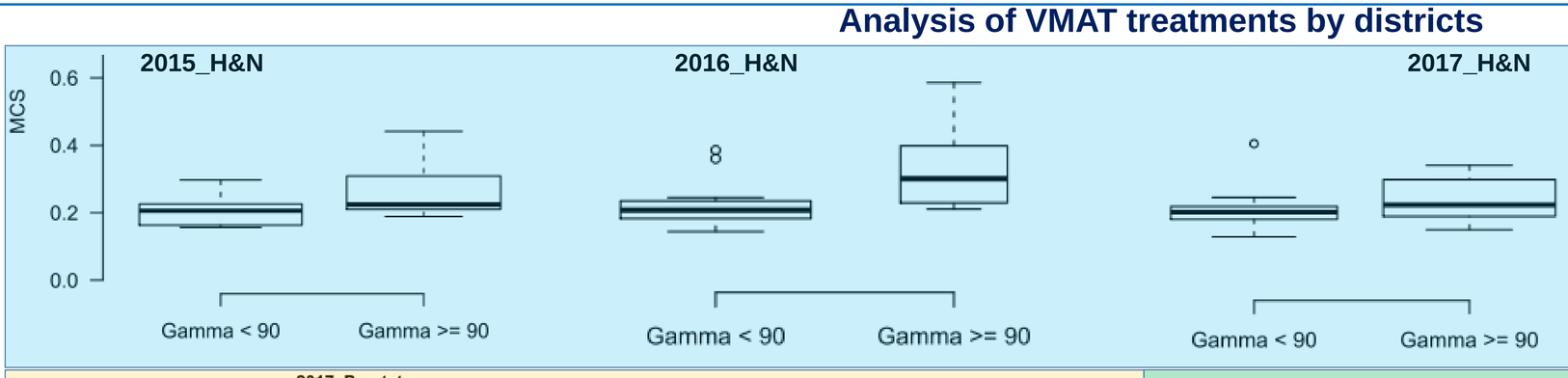
A retrospective analysis of VMAT treatments delivered in our center since 2015 has been performed by studying the correlation between the results of pretreatment dosimetric evaluation and different parameters related to the complexity of the treatment plans. Districts considered for this study include Head&Neck, Pelvis and Prostate.

- 3D pretreatment dose verifications has been performed by OCTAVIUS 4D (PTW) with matrix 729 on a Linac Elekta Synergy Agility.
- Analysis of volumetric 3D gamma (gamma index) has been done by using thresholds of 3%, 3mm and 10%.
- The treatment plans have been created with the TPS Pinnacle 9.10; since 2016, the autoplanning module was also considered.
- The complexity of each plan has been evaluated by a complexity index MCS* (low MCS high complexity) and the number of Monitor Units (MU).
- The plotes show MU and Gamma Index as function of MCS for all the evaluated treatment plans.

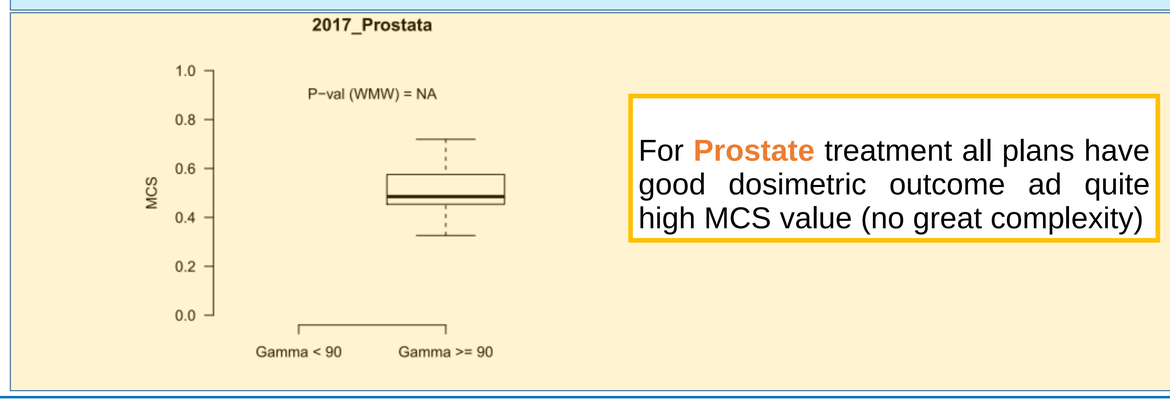


** Impact of plan parameters on the dosimetric accuracy of volumetric modulated arc therapy. al., Masi L. et. 2013, Med Phys, p. 40(7):071718.*

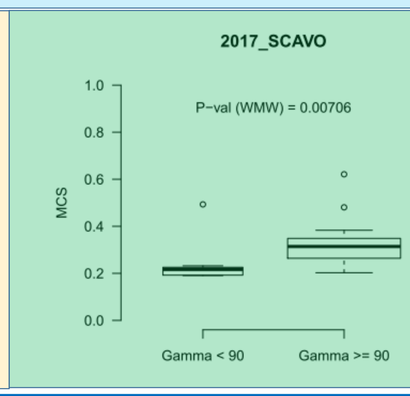
Analysis of VMAT treatments by districts



In **H&N treatments** there is a region around MCS = 0.2 where it is not possible to predict the outcome of gamma analysis



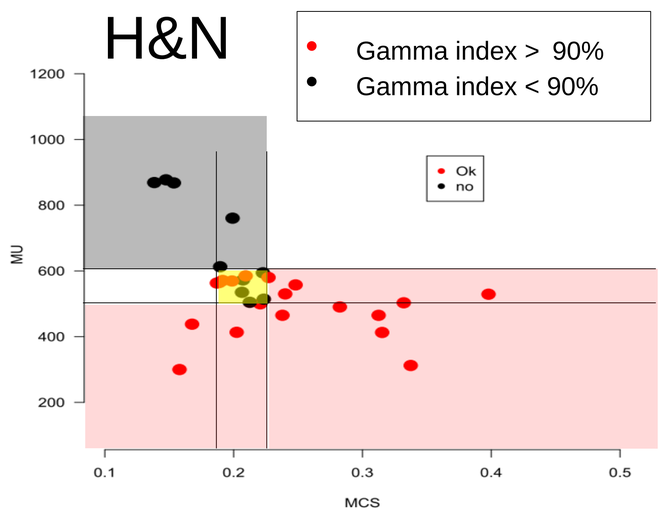
For **Prostate** treatment all plans have good dosimetric outcome ad quite high MCS value (no great complexity)

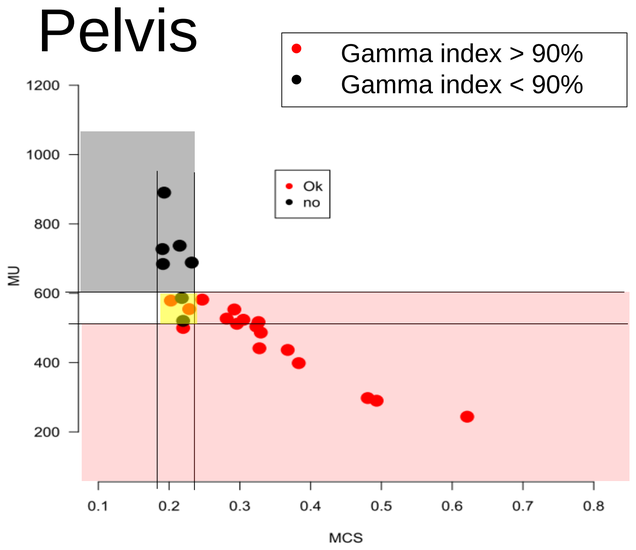


MCS is a good parameter to predict the outcome of gamma analysis for **Pelvis** treatments.

Correlation between plan complexity and pretreatment dosimetric evaluation: is it possible to set thresholds?

Plotting gamma index as a function of MCS and MU enables to define 3 distinct regions





Gamma index always not ok

MU > 600
MCS < 0.19

Gamma index always OK

MU < 500
MCS > 0.23

It is no possible to predict the outcome

500 < MU < 600
0.19 < MCS < 0.23

Conclusions

For Pelvi and Head&Neck our analysis suggests that it's possible to tag the agreement between the planned and the delivered dose distribution for VMAT plans on the basis of the corresponding complexity index (MCS) and the number of Monitor Unit (MU).

	Bad agreement	???	**Good agreement**
MCS	< 0.19	0.19 ↔ 0.23	> 0.23
MU	> 600	500 ↔ 600	< 500