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INTRODUCTION

The aim of this work is to evaluate the impact of the choice of the isocenter position for IMRT treatment plans for nasopharyngeal carcinomas treated with IMRT SW.

MATERIALS & METHODS

A cohort of fifteen patients, a total of 45 IMRT SW plans for UCNT tumors, were randomly chosen.

❖ For each case, three RCMI plans were created for different possible isocenter locations.

❖ The inverse planning was performed by the SIB technique 70Gy (2Gy / s) and 59.5 Gy (1.7Gy / s), using the TPS Eclipse 13.6 and PO algorithm v13.6 (Varian Medical Systems, PA, California).

❖ The plans named G_ISO, C_ISO, P_ISO correspond to the optimized plans whose isocenters are placed respectively at the center of the GTV T, CTV 70Gy and of the prophylactic PTV 59.5Gy.

❖ A comparative study of DVH of the spinal cord, brainstem and optic chiasma as well as their respective PRVs was conducted.

❖ The CI-ICRU83 conformity index, the HI-ICRU83 homogeneity index and the DSC similarity coefficient were calculated.

❖ The numbers of MUs of the different plans were also analyzed.

Isocenter Emplacement

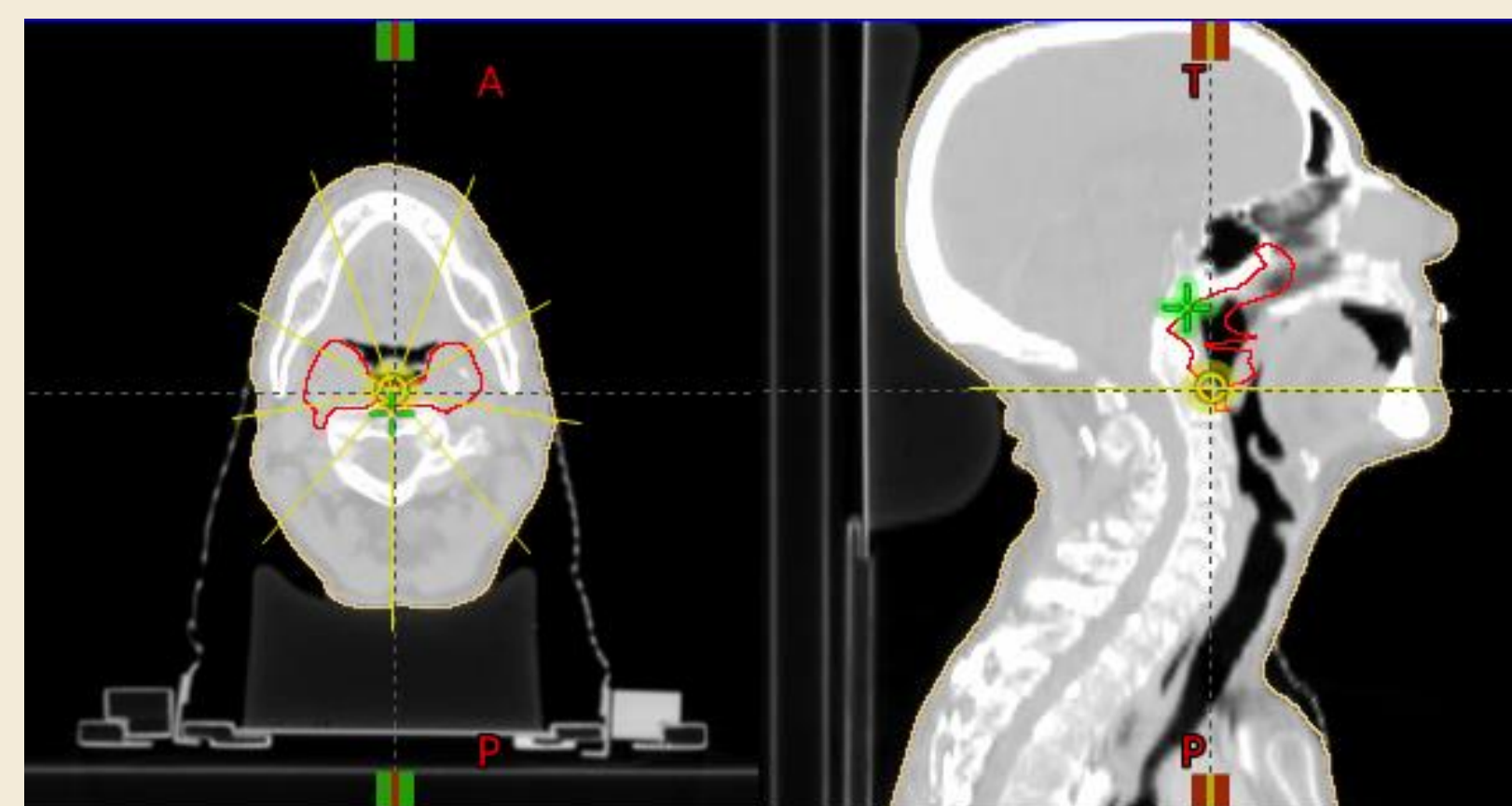


Figure 1. C_ISO

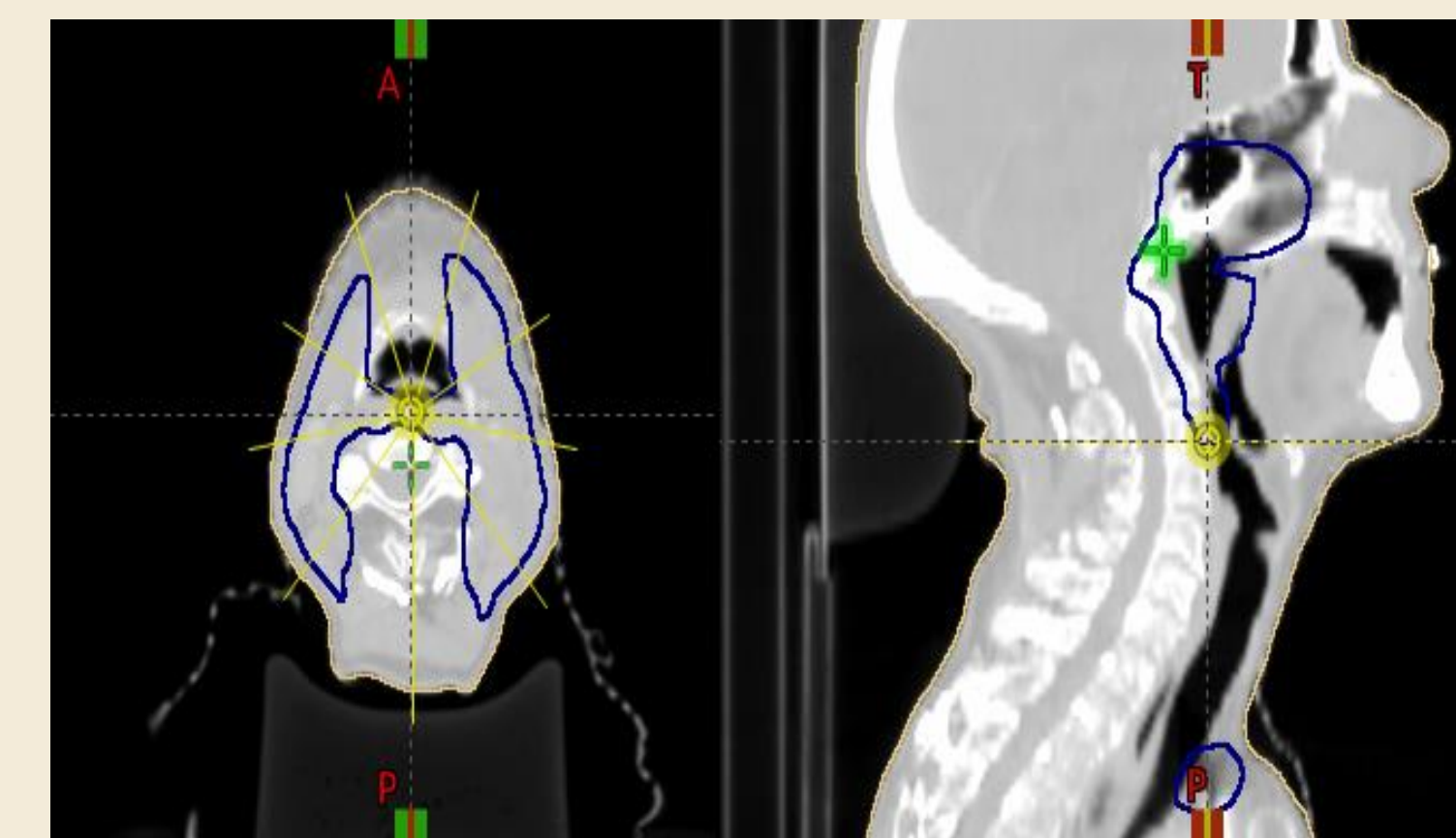


Figure 2. P_ISO

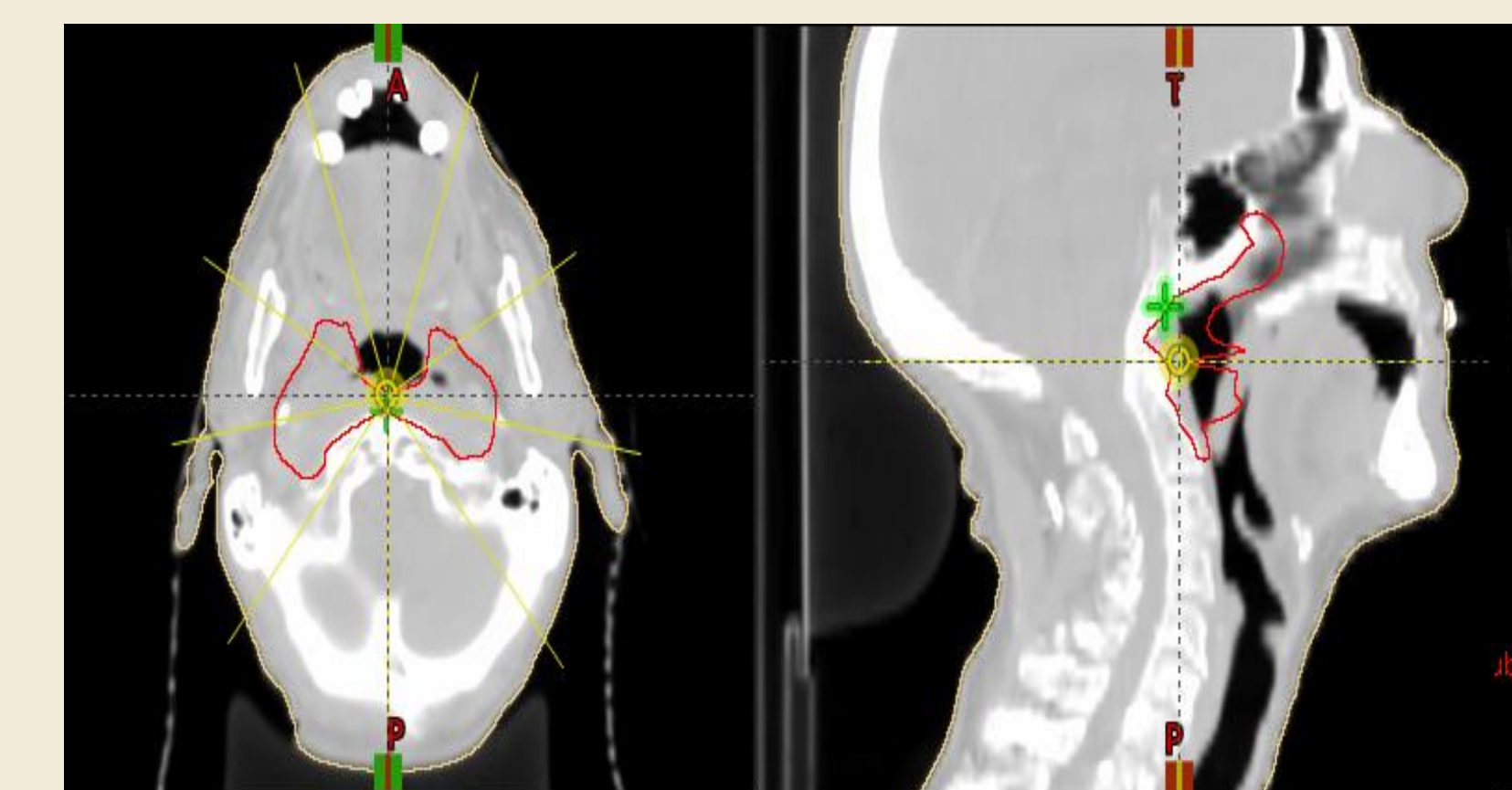
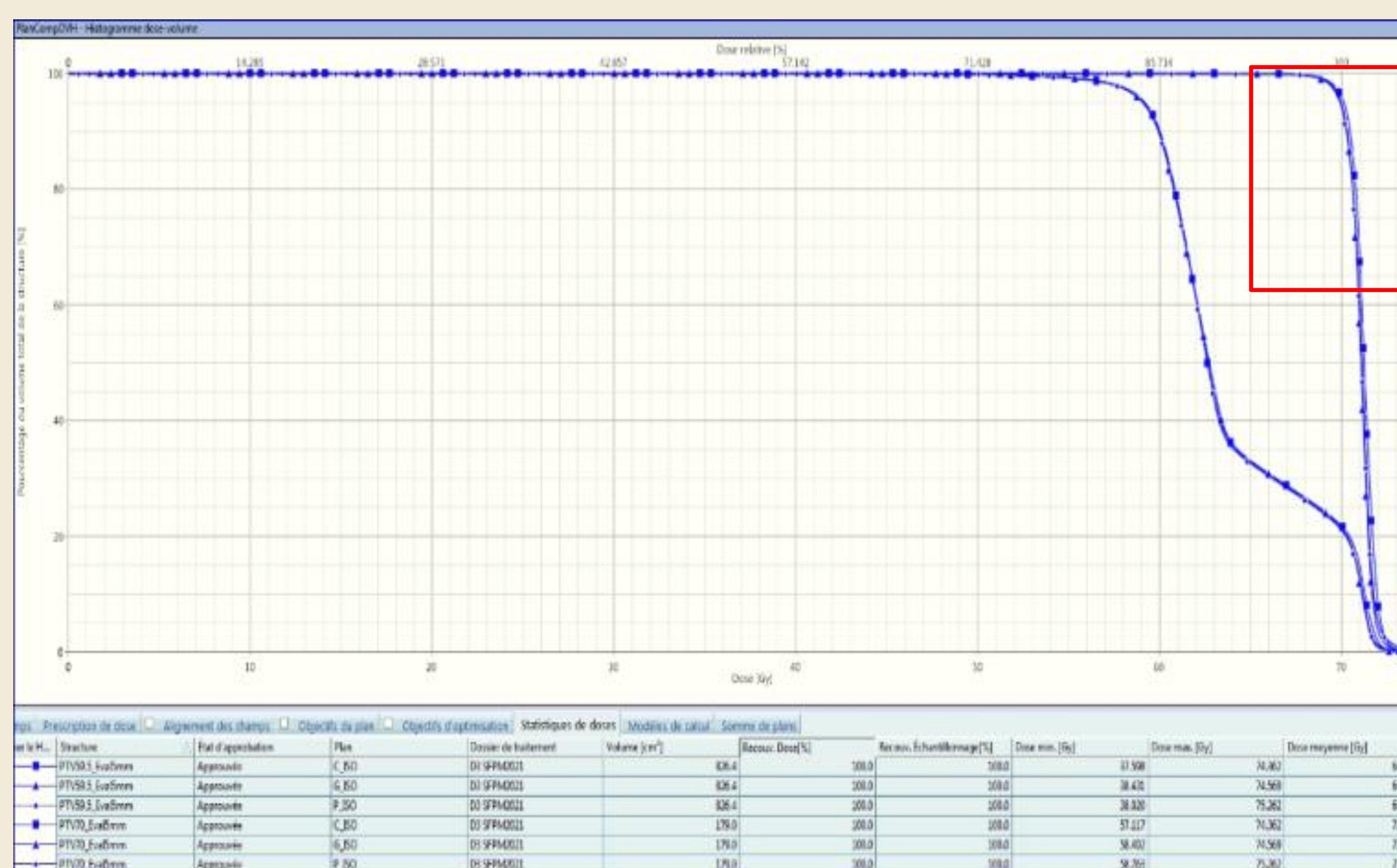
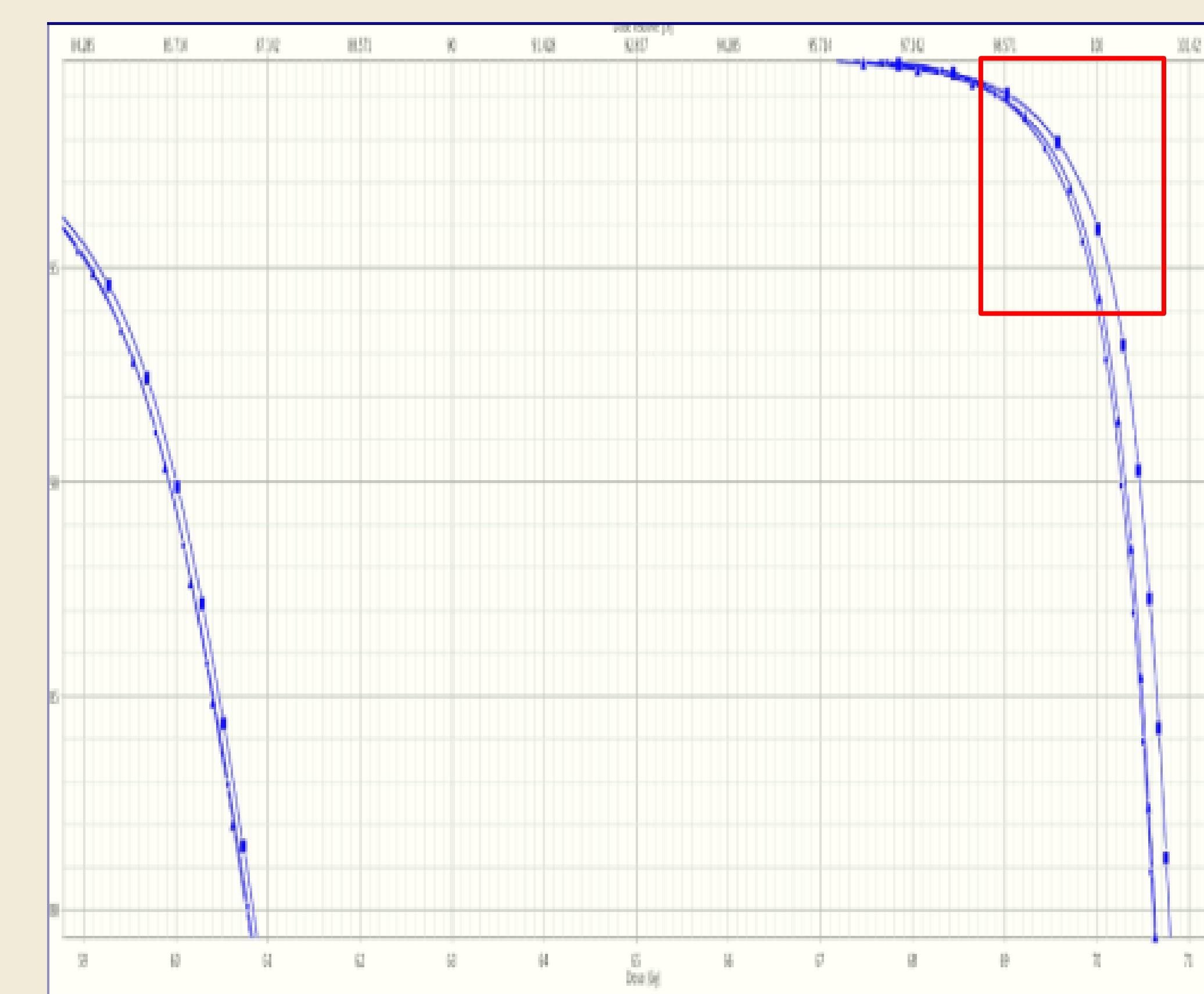


Figure 3. G_ISO



DVH Comparison PTV70-PTV59.5



P/Plan	PTV70_Eval5mm			
	VolumePTV	HI ICRU83	DSC	CI
C_ISO	240,500	0,092	0,924	1,133
C_ISO	351,400	0,115	0,985	0,983
C_ISO	272,660	0,106	0,924	1,117
C_ISO	795,770	0,139	0,923	1,008
C_ISO	389,700	0,125	0,852	1,143
G_ISO	240,500	0,086	0,937	1,131
G_ISO	351,400	0,092	0,989	0,990
G_ISO	272,660	0,102	0,892	1,129
G_ISO	795,770	0,138	0,922	1,006
G_ISO	389,700	0,119	0,857	1,135
P_ISO	240,500	0,092	0,911	1,127
P_ISO	351,400	0,114	0,884	1,259
P_ISO	272,660	0,105	0,895	1,106
P_ISO	795,770	0,122	0,931	1,006
P_ISO	389,700	0,118	0,859	1,105

Table1. Example of Comparison PTV70

P/Plan	VolumePTV	BrainStem	BrainStem_03	Chiasma	Chiasma_03	spinal	spinal_05			
		Dmax	Dmax	D2%	Dmax	Dmax	D2%	Dmax	Dmax	D2%
C_ISO	240,500	50,520	57,210	51,700	46,700	52,700	51,400	38,600	50,200	41,700
C_ISO	351,400	52,200	59,840	52,820	40,750	50,600	47,700	34,750	47,810	38,700
C_ISO	272,660	47,730	56,9	51,5	45,7	52,6	49,5	36,55	49,68	39,06
C_ISO	795,770	53,800	60	56,5	22,3	42,5	39	42,75	49,6	45,6
C_ISO	389,700	52,6	58,7	52,8	36,8	49,8	47,3	37,3	49,8	40,26
G_ISO	240,500	49,850	57,380	52,400	44,800	52,300	51,200	38,100	49,900	41,700
G_ISO	351,400	51,700	59,480	52,810	38,500	50,200	47,600	34,620	47,880	38,700
G_ISO	272,660	47,200	58,4	51,5	43,9	52,2	49,5	35,43	48,55	39,06
G_ISO	795,770	52,300	58,9	52,5	12,3	29,7	25	40,08	48,5	43,5
G_ISO	389,700	52,2	58,4	52,8	33,3	47,5	45	35,6	49,2	40,26
P_ISO	240,500	50,170	57,230	52,400	46,900	53,800	51,430	38,860	50,600	41,700
P_ISO	351,400	51,742	59,870	52,810	45,200	50,800	46,890	35,140	47,710	38,700
P_ISO	272,660	47,800	57,78	51,5	45,2	53,06	49,5	35,78	49,55	39,06
P_ISO	795,770	53,600	62,2	56,7	23	31,5	39	42,76	49,7	45,8
P_ISO	389,700	52,9	58,9	52,8	37	49,5	47,3	36,8	49,7	40,26

Table2. Example of Comparison OAR

RESULTS

- ✓ The G_ISO plans offer the best protection for the organs at risk : spinal cord, brainstem and chiasma as well as their PRVs.
- ✓ The HI_ICRU83 of the G_ISO, C_ISO and P_ISO plans was 1.077 ± 0.07 , 1.078 ± 0.07 and 1.121 ± 0.08 respectively.
- ✓ The HIICRU83 was 0.12 ± 0.02 ; 0.11 ± 0.02 and 0.11 ± 0.01 . The DSC was 0.919 ± 0.04 ; 0.922 ± 0.04 and 0.896 ± 0.02 .
- ✓ C_ISO plans had the lowest number of MUs delivered (1051 ± 105 MU).

CONCLUSIONS

There is no strict and standard rules to apply in the choice of the isocenter in the IMRT plans of the UCNTs.

The tumor volume, the PTV volume and the proximity of the OARs should be taken into account awaiting larger trial.