

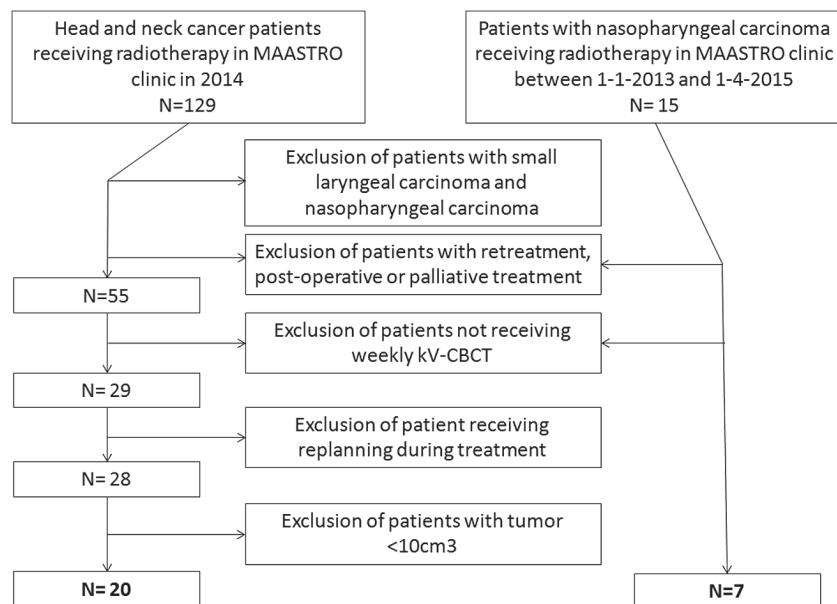
Supplementary material for Hermans B. C. M. et al. Weekly kilovoltage cone-beam computed tomography for detection of dose discrepancies during (chemo)radiotherapy for head and neck cancer, Acta Oncol, 2015; 54: 1483–1489.

Appendix

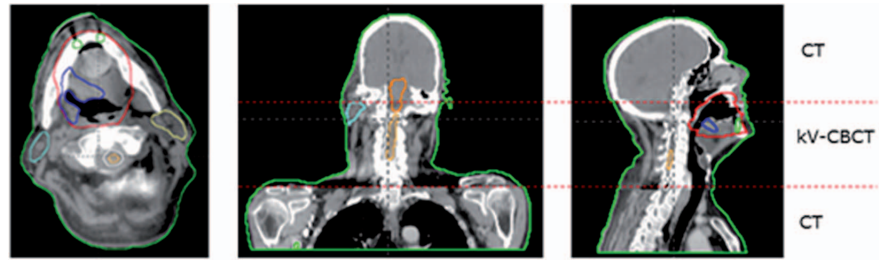
For twenty patients in cohort 1 a total of 139 kV-CBCT images was reviewed. Twenty primary GTVs and 21 lymph node GTVs (combining left and right lymph node levels) were identified. Since the GTVs covered the bilateral head and neck region in the majority of the patients, no distinction between ipsi- and contralateral parotid and submandibular glands was made, and these structures were combined in the analysis. For four patients, parotid gland volume was not enclosed in the kV-CBCT image, and therefore weekly evaluation of parotid gland volume and delivered dose therein was not possible. This resulted in

the evaluation of parotid glands in sixteen patients (32 parotid glands). Since two submandibular glands were completely included within the PTV, they were excluded from analysis resulting in a total of 38 submandibular glands being analyzed. The dose to the spinal cord was investigated for all patients.

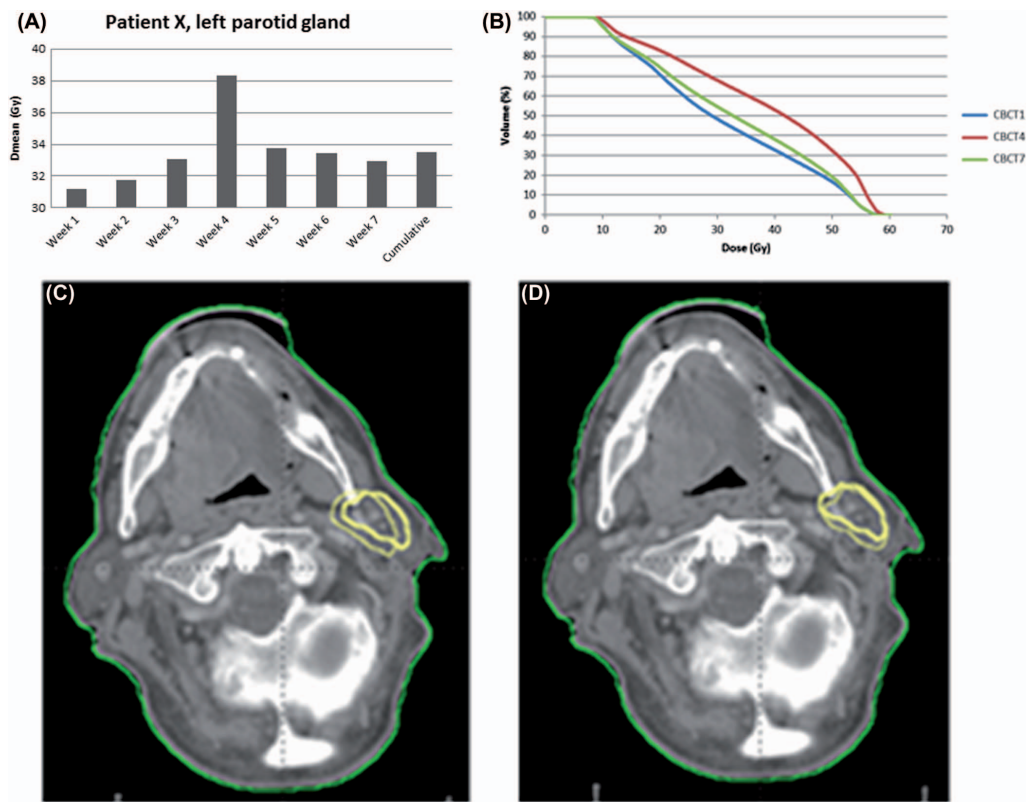
In cohort 2, a total of 45 kV-CBCT images was reviewed for seven patients. For all patients dose to GTV, parotid glands (left and right combined), submandibular glands (left and right combined) and spinal cord was recalculated. Analysis of left and right lymph nodes was combined, resulting in evaluation of nine lymph node levels.



Supplementary Figure 1. Process of inclusion and exclusion of patients in Cohort 1 and 2.



Supplementary Figure 2. Delineation of GTV (dark blue), oral cavity (red), parotid glands (light blue and yellow), spinal cord (orange) and brainstem (dark orange) in a patient with a cT3N0M0 oropharyngeal carcinoma undergoing (chemo)radiotherapy. Dashed red lines indicate junction lines of kV-CBCT to CT scan.



Supplementary Figure 3. Left parotid gland of patient X with cT4N1M0 squamous cell carcinoma of the tongue. A) Dose discrepancy in Dmean between kV-CBCT in first week of treatment and subsequent weeks. B) Dose volume histogram for kV-CBCT 1, kV-CBCT 4 and kV-CBCT 7 (Dmean kV-CBCT 1 = 31.2 Gy, blue; kV-CBCT 4 = 38.3 Gy, red; kV-CBCT 7 = 32.9 Gy, green). Projection of the delineation on kV-CBCT images of left parotid gland in patient X on planning CT scan. C) delineation on kV-CBCT 1 (bold) and kV-CBCT 4. D) delineation on kV-CBCT 1 (bold) and kV-CBCT 7.

Supplementary Table I. Planned dose and actually delivered cumulative dose for individual patients in cohort 1.

Patient	Planned D _{95%} primary tumor (Gy)	Actually delivered D _{95%} primary tumor (Gy)	Planned D _{95%} lymph nodes (Gy)	Actually delivered D _{95%} lymph nodes (Gy)	Planned D _{mean} to parotid gland (Gy)	Actually delivered D _{mean} to parotid gland (Gy)	Planned D _{mean} to submand. gland (Gy)	Actually delivered D _{mean} to submand. gland (Gy)	Planned D _{2%} to spinal cord (Gy)	Actually delivered D _{2%} to spinal cord (Gy)
Right/ middle										
1	71.3	71.5			28.6	27.3	52.3	52.6	45.7	45.8
2	70.3	71	70.1	70.9			67.7	68.4	42.1	41.6
3	69.7	70.3	70.3	71	49.5	50.1	71.3	72.1	42.7	43
4	69.2	69.7			23.1	22	51.2	51.3	42.4	43
5	70.9	71.3			38.9	39.2	49.8	54.5	41.7	42.8
6	67.1	67			17.1	16.9	54.2	56.5	38.5	38.5
7	69.3	68.9	70	70	32.8	32.3	66.6	64.9	44.2	44.2
8	70.6	70.7			48.5	51.9	67.8	70.6	43.8	44
9	70.7	71.3	71	70.5	36.2	35	62.8	64.8	42.6	42.6
10	70.7	70.3	70.5	70.5			60.3	57.3	40.9	40.6
11	68.8	68.4	68.3	68.4	27.5	26.1	69.2	68.7	37.2	36.6
12	69.5	69.5			31.8	29.3	56.8	57	42.1	42.9
13	69.4	69.2			8.4	8.2	60.9	62.4	41.4	41.9
14	71.8	71.1			25.5	23.8	59	58.1	41	40.7
15	68.6	69.2	68.8	69.3	15.5	13.3	64.8	63.7	42.9	42.4
16	69.1	69	68.8	68.6			66.3	65.5	39.6	39.7
17	68.3	67.4	68.6	68.5			65.3	65.5	39.2	39.2
18	70.2	70.4	70.6	70.7	23.7	24.3	65.1	62.3	41.4	41.7
19	69.5	69.3			4.7	4.6	49.5	49.3	38.4	38
20	69.2	68.9	69.6	70	13.9	14.3	58.4	57.2	43.1	43.2
Left										
1			71.6	71.7	61.6	64				
2			71	71.4			58	58.2		
3			70.3	70.8	51.3	54.9				
4					35.9	35.5	63.2	64.7		
5			71.3	71.5	45.5	46.3	71.6	71.9		
6					15	16.2	47.2	47.7		
7			69.7	69.9	33.1	34.3	51.6	50.8		
8					22.1	22.1	59.6	59.4		
9					16.1	14.8	54.8	55.9		
10							43	41.7		
11					31.2	33.5	54.4	54.2		
12			68.6	68.6	42.4	43.1	70	69.7		
13			69.4	69.4	12.5	12.1	59.3	59.8		
14			71.9	71.8	15.4	16.5	64.6	64.5		
15					11.9	9.4	56	55.5		
16							48	47.1		
17							59.6	59.8		
18					19.2	18.9	57.1	56		
19			69.1	68.6	19.9	18.1	66.8	64.8		
20			69.7	70.2	12.6	12.7	53.8	52.5		

Right/middle: Cells compromise information about the primary tumor located near the center of the patient and right sided lymph nodes and organs at risk.

Left: Cells compromise information about left sided lymph nodes and organs at risk.

D_{95%} = Dose delivered to 95% of the target volume. D_{mean} = Mean dose delivered to the total volume of the gland. D_{2%} = Dose delivered to 2% of the spinal cord. Submand. gland = submandibular gland. **Bold** = increase > 2Gy (parotid and submandibular glands)/ > 1Gy (spinal cord). **Italic** = clinically relevant increase.

Supplementary Table II. Planned dose and actually delivered cumulative dose for individual patients in cohort 2.

Patient	Planned D _{95%} primary tumor (Gy)	Actually delivered D _{95%} primary tumor (Gy)	Planned D _{95%} lymph nodes (Gy)	Actually delivered D _{95%} lymph nodes (Gy)	Planned D _{mean} to parotid glands (Gy)	Actually delivered D _{mean} to parotid glands (Gy)	Planned D _{mean} to submand. glands (Gy)	Actually delivered D _{mean} to submand. glands (Gy)	Planned D _{2%} to spinal cord (Gy)	Actually delivered D _{2%} to spinal cord (Gy)
Right/ middle										
1	71.78	72.01			44.87	45.33	52.48	52.74	43.04	43.57
2	70.14	70.8	70.14	70.61	18.58	18.61	43.24	43.38	47.81	48.36
3	69.8	70.05			36.84	40.8	45.99	45.71	35.53	36.79
4	70.26	70.29	70.49	70.86	44.67	44.8	65	65.44	44.94	45.94
5	71.36	71.72	71.02	71.46	37.4	38.07	49.76	51.17	45.21	42.69
6	66.1	66.04	70.68	69.29	53.05	54.17	58.9	58.54	43.87	44.67
7	64.62	63.54			29.61	30.91	38	37.64	40.91	41.48
Left										
1			71.46	72.16	54.03	55.41	70.81	71.52		
2			70.62	70.95	29.38	30.75	47.19	44.83		
3					30.21	31.82	47.51	44.02		
4			72.07	72.34	39.49	40.4	44.29	45.02		
5			71.35	70.86	36.8	39.32	49.36	49.31		
6			70.94	70.7	48.1	48.04	42.59	40.98		
7					29.17	29.49	38.91	38.47		

Right/middle: Cells compromise information about the primary tumor located near the center of the patient and right sided lymph nodes and organs at risk.

Left: Cells compromise information about left sided lymph nodes and organs at risk.

D_{95%} = Dose delivered to 95% of the target volume. D_{mean} = Mean dose delivered to the total volume of the gland. D_{2%} = Dose delivered to 2% of the spinal cord. Submand. gland = submandibular gland. **Bold** = increase > 2Gy (parotid and submandibular glands) / > 1Gy (spinal cord). **Italic** = clinically relevant increase.