

**SUPPLEMENTARY MATERIAL****Supplementary Table 1: UICC stage of patients according to the TNM 7<sup>th</sup> edition**

	No. (n=79)	%
<b>UICC stage (according to TNM 7<sup>th</sup> edition)</b>		
II	1	(1)
III	14	(18)
IVA	46	(58)
IVB	18	(23)

**Supplementary Table 2: Subsequent treatment of patients not entering RIT**

	No. (n=19)	%
Definitive platinum-based radiochemotherapy	12	63%
Surgery followed by radio(chemo)therapy	2	11%
Definitive radiotherapy + Cetuximab	1	5%
Definitive radiotherapy + Durvalumab	1	5%
Definitive radiotherapy	1	5%
Chemotherapy	1	5%
No further treatment (patient's refusal due to pCR)	1*	5%

\*Patient is still in remission at end of study follow up (2 years).

**Supplementary Table 3: Peripheral blood immune markers associated with RRM (p<0.2)**

Immune cell subsets	Unit	mean of non-RRM	mean of RRM	p-value
mDC	cells/ $\mu$ l	11.35	14.54	0.0086
DC	cells/ $\mu$ l	19.66	21.27	0.0298
B cells (HLA-DR+)	%	98.17	93.68	0.0321
DNT	cells/ $\mu$ l	44.45	76.68	0.0371
mDC-1	cells/ $\mu$ l	0.82	1.15	0.0573
Neutrophils (HLA-DR+)	%	0.33	0.49	0.0601
mDC-2	cells/ $\mu$ l	10.39	13.14	0.0783
T cells (HLA-DRhigh)	%	1.97	2.48	0.1031
Monocytes (CD14low/CD16+)	cells/ $\mu$ l	23.83	19.90	0.1133
T4:T8 ratio	cells/ $\mu$ l	2.37	1.99	0.1281
T helper cells (CD25high)	cells/ $\mu$ l	4.12	5.04	0.1383
NKT cells (CD16+)	cells/ $\mu$ l	8.81	4.45	0.1459
Monocytes (CD14low/CD16-)	cells/ $\mu$ l	0.04	0.53	0.1645

pDC	cells/ $\mu$ l	8.49	6.86	0.1856
Monocytes (CD14high/CD16-)	cells/ $\mu$ l	82.27	78.45	0.1966

P-value: adjusted by clinical factors (T stage (T4 vs others), HPV/p16, intratumoral CD8+ cell density, programmed cell death ligand 1 (PD-L1), tumor cell area (TC area) and PD-L1 immune cell area (IC area))

**Supplementary Figure 1: Kaplan-Meier analysis of PFS and OS of patients excluded from radioimmunotherapy (n=19).**

Kaplan-Meier estimates of (A) progression-free survival and (B) overall survival of patients that received alternative treatment outside the trial after induction chem-immunotherapy. Tick marks indicate censored observations. Pts, Patients.

**Supplementary Figure 2: Kaplan-Meier estimates of PFS and OS in HPV positive oropharyngeal cancers and other HNSCCs.**

Kaplan-Meier estimates of (A) progression-free survival and (B) overall survival of the radioimmunotherapy cohort divided in p16 positive oropharyngeal cancers and other tumors. Kaplan-Meier estimates of (C) progression-free survival and (D) overall survival of the entire study cohort divided in p16 positive oropharyngeal cancers and other tumors. Tick marks indicate censored observations. RIT, radioimmunotherapy.