Supplemental Table 1: PET-CT acquisition parameters of the 3 Hospital Centers

	Rennes Hospital Center	**Nantes Hospital Center**	**Brest Hospital Center**
Injection	4 MBq/kg of FDG[d] (0.0001Ci/kg)	3 MBq/kg of FDG[d] (0.00008Ci/kg)	3 MBq/kg of FDG[d] (0.00008Ci/kg)
Fasting period before injection (mean, hours)	4	5	6
Uptake time (mean, minutes)	60	60	60
Imaging system	Discovery PET/CT[e] imaging-system or Siemens Biograph 6 True Point PET/CT scanner (Siemens Healthineers©, Erlangen, Germany)	Biograph-mCT™ 40 or 64 imaging system (Siemens Healthineers©, Erlangen, Germany)	Biograph-mCT™ 40 or 64 imaging system
Reconstruction	OSEM[a] (2 iterations, 28 subsets) Iterative fully 3D (Discovery ST)	OSEM[a] with PSF[b] correction and TOF[c] information	OSEM[a] with PSF[b] modeling and TOF[c] acquisition capabilities method

[a]OSEM: Ordered Subset Expectation Maximization , [b]PSF: Point spread function, [c]TOF: Time-of-Flight, [d]FDG : Fluorodeoxyglucose (IBA Molecular Imaging, Saclay, France)., [e]PET/CT: Positron Emission Tomography/Computed Tomography

Supplemental Table 2: Patient, tumor, treatment and follow-up characteristics for the training and validation cohorts

Characteristics	Training cohort (N = 318 patients)	Validation cohort (N = 64 patients)	p-value*
Patients			
Age, mean (SD)	61.51 (9.33)	58.86 (10.82)	0.071
Gender, n (%)			0.272
Male	260 (82.07)	56 (87.50)	
Female	58 (17.93)	8 (12.50)	
Smoking status (yes, n (%))	269 (84.59)	55 (85.94)	0.744
Amount of tobacco (pack-year, SD)	23.34 (24.73)	18.84 (21.42)	0.176
Alcohol consumption (yes, n(%))	166 (52.20)	29 (45.31)	0.326
Amount of alcohol consumed (g, SD)	21.59 (41.18)	14.41 (28.38)	0.092
Performance Status, n (%)			0.564
0-1	309 (97.17)	63 (98.44)	
2	9 (2.83)	1 (1.56)	
Tumor			
Tumor site, n (%)			0.777
Oral cavity	106 (33.33)	20 (31.25)	
Oropharynx	77 (24.21)	18 (28.13)	
Larynx	74 (23.27)	12 (18.75)	
Hypopharynx	61 (19.18)	14 (21.88)	
cT classification, n(%)			0.016
T1	80 (25.16)	8 (12.50)	
T2	85 (27.04)	14 (21.88)	
T3	43 (13.52)	17 (26.56)	
T4	110 (34.28)	25 (39.06)	
cN classification, n(%)			0.065
N0	144 (45.28)	17 (26.56)	
N1	49 (15.41)	9 (14.06)	
N2	118 (31.11)	35 (54.69)	
N3	7 (2.20)	3 (4.69)	
Staging AJCC, n (%)			0.034
I	44 (13.84)	2 (3.13)	
II	38 (12.26)	4 (6.25)	
III	51 (16.04)	12 (18.75)	
IV	185 (57.86)	46 (71.88)	
pT classification, n (%)			0.016
pT1	72 (22.64)	7 (10.64)	
pT2	94 (29.56)	13 (20.31)	
pT3	47 (14.78)	17 (26.56)	
pT4	105 (33.02)	27 (42.19)	
pN classification, n (%)			0.028
pN0	151 (47.48)	19 (29.69)	
pN1	42 (13.21)	10 (15.63)	
pN2a	15 (4.71)	3 (4.69)	
pN2b	68 (21.38)	21 (32.81)	
pN2c	33 (10.38)	7 (10.94)	
pN3	9 (2.83)	4 (6.25)	
Lymph node involvement, mean number (SD)	1.70 (3.47)	2.05 (6.44)	0.217
Extracapsular extension, n (%)	94 (29.56)	26 (40.63)	0.082
Negative surgical margin, n(%)	252 (79.25)	34 (53.13)	0.001
Perineural invasion, n (%)	94 (29.56)	26 (40.63)	0.082
Vascular invasion, n (%)	48 (15.09)	27 (42.19)	0.001
p16 status, n(%)			0.004
Yes	16 (5.03%)	10 (15.63)	
No	21 (6.60%)	7 (10.94)	
Not applicable/available	281(88.37%)	47 (73.44)	
Tumor volume in mL (SD)			
Primitive tumor	28.90 (29.18)	34.93 (28.33)	0.130
Total (tumor and nodes)	45.18 (49.07)	53.72 (42.32)	0.195
Treatment			
Type of surgery			0.267
Oropharyngectomy	80 (25.16)	18 (28.13)	
Glossectomy	30 (9.43)	5 (7.81)	
Mandibulectomy I or NI or maxillectomy	73 (22.96)	15 (23.43)	
Partial laryngectomy	44 (13.84)	3 (4.69)	
Total laryngectomy/ pharyngolaryngectomy	91 (28.61)	23 (35.94)	

Radiotherapy postsurgery, n (%)	210 (66.04)	54 (84.38)	0.004
Concomitant chemotherapy, n(%)	120 (37.74)	38 (59.38)	0.006
Follow-up			
Distant Metastasis, n(%)	51 (16.04)	10 (15.63)	0.934
Deaths, n(%)	116 (36.48)	19 (29.69)	0.299

SD = standard deviation, 95% CI = 95% confidence interval, AJCC = American Joint Committee on Cancer, NI = Noninterruptive, I = Interruptive

*= Mann-Whitney test for continuous variables, chi² for dichotomous variables, or Fisher exact test when the frequency was small and log-rank test for survival analysis.

Supplemental Table 3: Results of the Cox model bootstrap validation (1000 resampling) for overall survival
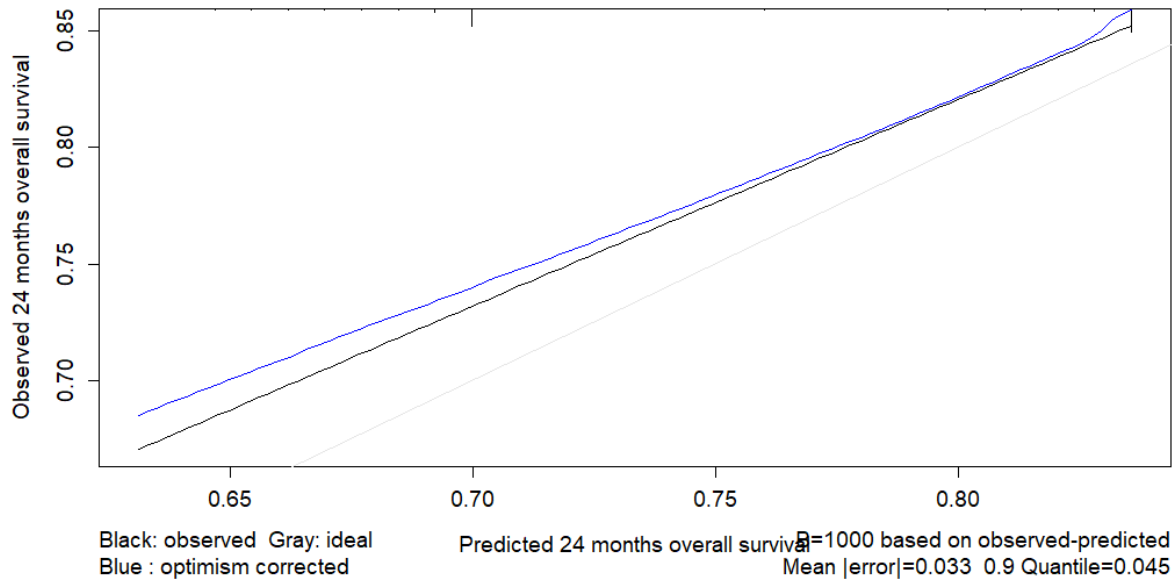
Parameters	HR[95% CI]	P value of the parameter	c-index
Stage T		<0.001	
T1-T2	Ref.		
T3-T4	2.01 [1.13 ; 4.65]		0.63
MTV N (SUV = 3.0)	1.01 [1 ;1.18]	0.03	

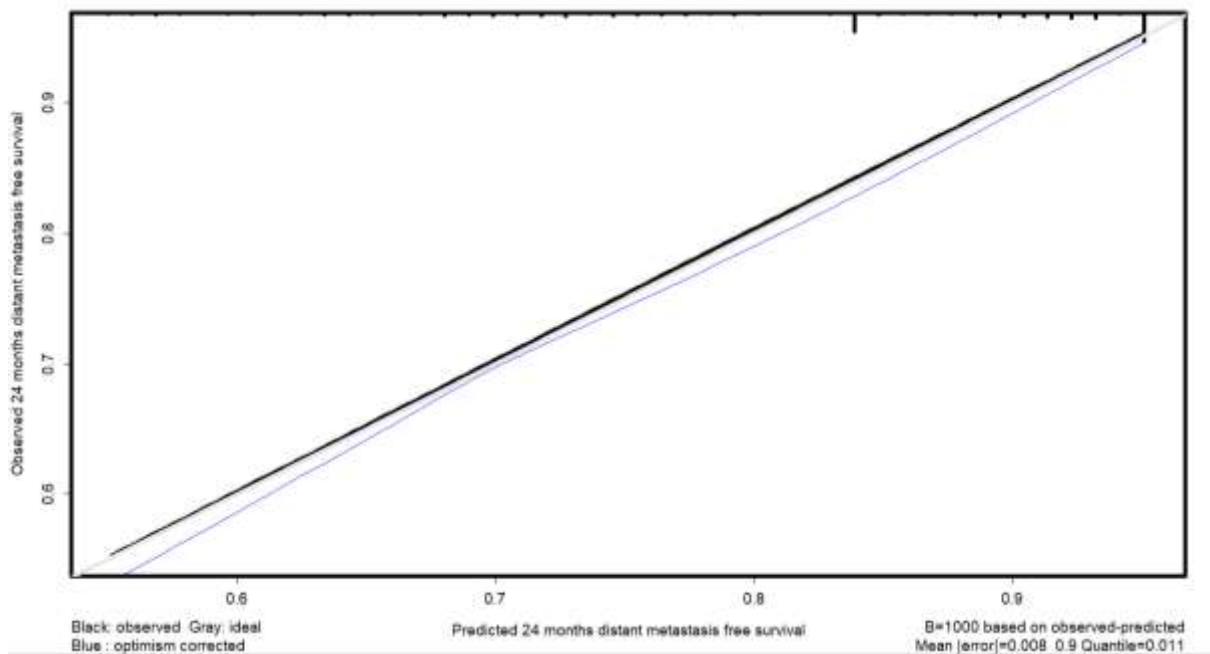HR = Hazard ratio, 95% CI = 95% confidence interval

Supplemental Table 4: Results of the Cox model bootstrap validation (1000 resampling) for distant metastasis

Parameters	HR[95% CI]	P value of the parameter	c-index
Stage T		<0.001	
T1-T2	Ref.		
T3-T4	3.59 [1.9-7.6]		0.74
MTV N (SUV = 3.0)	1.01 [1.0;1.02]	0.055	
Distance max TN	1.12 [1.03;1.21]	0.007	

HR = Hazard ratio, 95% CI = 95% confidence interval, NS=Not significant, Distance max TN = Maximal tumor-node distance

Supplemental Figure 1: Internal calibration of the final OS model for the training cohort at 24 months. The gray line is the ideal model, the black line is the observed survival, and the blue-dotted line is the predicted survival corrected to avoid overfitting.

Supplemental Figure 2: Internal calibration of the final DMFS nmodel for the training cohort at 24 months. The gray line is the ideal model, the black line is the observed survival and the blue-dotted line is the predicted survival corrected to avoid overfitting.