



Supplemental Fig.1 Schematic diagram of CTV delineation and field design.

Definition of Involved Field Irradiation (IFI): The gross tumor volume (GTV) included GTVt (tumor) and GTVnd (lymph node), which was defined as any visible tumors or positive lymph nodes based on upper endoscopy and endoscopic ultrasound evaluations or were shown on barium esophagogram, CT scan with contrast, positron emission tomography (PET). The clinical target volume (CTV) consisted of CTVt and CTVnd. CTV was defined as the GTVt plus additional 3cm cranial-caudal and 0.7-1cm radial margins, and CTVnd was defined as GTVnd plus 0.5-1.0 cm radial margin. In order to account for daily set-up errors during treatment, the planning target volume (PTV) was created with a 0.5-1.0 cm margin from GTV and CTV respectively, which were named as PGTV (PGTVt and PGTVnd) and PCTV (PCTVt and PCTVnd), respectively.

Definition of Elective Nodal Irradiation (ENI): The definition for GTVt, GTVnd and CTVt were the same as that of IFI. CTV included CTVt, positive lymph node region and the areas at risk as elective nodal regions, including supraclavicular, mediastinal or perigastric/cealic regions according to the location of primary tumor. The PTV definition was the same as that of IFI.

IFI (A) and ENI (B-D) field in the coronal direction. (B) cervical EC; (C) middle thoracic EC; (D) lower thoracic EC. Representative cases of recurrence occurred within PGTV(F), PCTV (G) and out of field (H). Failure patterns were demonstrated based on the original treatment planning coronal CT scans, with matched posttreatment PET/CT scans showing recurrence which were visible as bright spots on the fusion image.

**Supplementary table 1. Univariate analysis of prognostic factors on treatment results
for elderly esophageal cancer (EC)**

Characteristics	3-year OS		3-year LRFFS		3-year DMFS		3-year PFS	
	%	<i>P</i>	%	<i>P</i>	%	<i>P</i>	%	<i>P</i>
Age (years)		0.007**		0.137		0.252		0.007**
< 75	46.6		64.2		85.0		31.9	
≥ 75	24.4		55.6		69.8		18.6	
Sex		0.642		0.181		0.643		0.561
Male	33.2		53.8		79.0		27.8	
Female	38.8		67.7		75.5		32.2	
Smoking (pack-years)		0.617		0.447		0.652		0.724
<20	36.0		62.1		72.8		29.4	
≥20	32.2		49.4		67.2		29.7	
Alcohol		0.837		0.383		0.558		0.959
Not heavy drinking	36.2		59.9		75.7		29.2	
Heavy drinking	26.2		45.4		79.6		31.1	
Comorbidities		0.940		0.932		0.981		0.624
No	35.4		59.0		78.6		28.2	
Yes	35.3		57.6		76.4		30.3	
ECOG performance status		0.565		0.710		0.336		0.864
0-1	35.2		57.4		76.5		28.8	
2-3	37.0		51.5		83.3		37.7	
Weight loss before therapy		0.355		0.440		0.752		0.190
<5	33.3		58.5		79.5		37.1	
≥5	28.7		44.9		81.9		25.8	
Weight loss during therapy		0.023**		0.054*		0.456		0.102*
<5	45.1		63.5		83.4		37.8	
≥5	19.2		43.0		85.7		20.5	
Primary tumor location		0.176		0.166		0.236		0.192
Upper-middle	41.8		59.4		71.5		31.4	
Middle-lower	29.5		57.9		83.5		27.6	
Primary tumor length		0.186		0.149		0.970		0.027**
< 6.5cm	39.7		65.1		80.1		36.6	
≥ 6.5cm	32.6		54.6		76.3		25.3	
AJCC Stage		0.003**		0.026**		0.073*		0.003**
I - II	55.8		77.5		90.8		50.0	
III	28.7		51.1		72.3		22.7	
T stage		0.001**		0.075		0.221		0.002**
1-2	66.8		77.9		88.1		62.1	
3-4	29.0		53.6		74.8		23.3	
N stage		< 0.001**		< 0.001**		0.019**		< 0.001**
0-1	48.3		68.0		83.2		40.3	

2-3	16.1		43.1		64.0		13.2	
Radiotherapy technique		0.484		0.113		0.808		0.556
IMRT	34.6		64.2		69.7		32.0	
VMAT	30.4		49.6		42.0		28.7	
CTVnd delineation		0.925		0.615		0.652		0.648
IFI	35.7		61.5		79.5		30.4	
ENI	33.9		51.7		72.9		28.0	
Dose boost schemes		0.044**		0.018**		0.234		0.025**
Sequential boost	25.3		48.2		59.6		15.2	
SIB	41.1		65.0		81.3		35.7	
Fraction dose (Gy)		0.005**		0.009**		0.321		0.003**
≤ 2	24.7		49.4		70.6		20.0	
> 2	46.4		69.4		83.5		40.8	
GTV dose (Gy)		0.002**		0.155		0.044		0.006**
< 56	0		39.7		83.5		9.7	
≥ 56	39.7		60.4		70.6		32.8	
CTV dose		0.545		0.12		0.665		0.153
< 50	28.0		57.9		53.8		13.1	
≥ 50	36.6		62.9		80.0		32.6	
Concurrent chemotherapy		< 0.001**		0.053*		0.479	<i>p</i>	< 0.001**
No	23.9		52.0		79.9		19.3	
Yes	47.6		64.8		76.4		40.4	
Chemotherapy agent		0.002**		0.134		0.073		0.002**
No agent (reference)	23.9		52.0		79.9		19.3	
Single agent	46.9	0.001**	69.6	0.050	80.6	0.897	42.0	<0.001**
Double agent	45.7	0.066	53.5	0.531	69.7	0.062	35.7	0.115

Abbreviations: ECOG, eastern cooperative oncology group; IMRT, intensity-modulated radiotherapy; VMAT, volumetric-modulated arc therapy; GTV, gross tumor volume; CTV: clinical target volume; IFI, involved field irradiation; ENI, elective nodal irradiation; SIB, simultaneous integrated boost.

** $p < 0.05$

* $P < 0.1$

Supplemental table 2. Univariate analysis of prognostic factors influencing Toxicities of Neutropenia of elderly esophageal cancer

Variables	%	P	OR	95% CI	
				Lower	Upper
Age		0.290			
< 75	43.5		1.000		
≥ 75	56.5		0.700	0.361	1.356
Sex		0.117			
Male	63.6		1.000		
Female	36.4		1.711	0.875	3.347
Smoking (pack-years)		0.621			
<20	70.1				
≥20	29.9		0.831	0.399	1.731
Alcohol		0.463			
Not heavy drinking	90.2		1.000		
Heavy drinking	9.8		1.476	0.521	4.179
Comorbidities		0.478			
No	58.2		1.000		
Yes	41.8		0.783	0.398	1.539
ECOG performance status		0.673			
0-1	89.1		1.000		
2-3	10.9		1.245	0.450	3.448
Weight loss before therapy		0.230			
<5	66.3		1.000		
≥5	33.7		1.728	0.707	4.227
Weight loss during therapy		0.434			
<5	80		1.000		
≥5	20		0.667	0.241	1.843
Primary tumor location		0.726			
Upper-middle	47.8		1.000		
Middle-lower	52.2		0.889	0.46	1.717
Primary tumor length		0.167			
< 6.5cm	35.3		1.000		
≥ 6.5cm	64.7		1.667	0.808	3.439
AJCC Stage		0.495			
I - II	22.3		1.000		
III	77.7		1.333	0.584	3.046
T stage		0.937			
1-2	16.3		1.000		
3-4	83.7		0.965	0.398	2.340
N stage		0.459			
0-1	58.7		1.000		
2-3	41.3		1.285	0.662	2.495

Radiotherapy technique		0.176			
IMRT	60.3		1.000		
VMAT	39.7		1.582	0.814	3.077
CTVnd delineation		0.415			
IFI	77.2		1.000		
ENI	22.8		1.370	0.643	2.923
Dose boost schemes		0.473			
Sequential boost	35.3		1.000		
SIB	64.7		0.780	0.396	1.538
Fraction dose (Gy)		0.219			
≤ 2	54.9		1.000		
> 2	45.1		0.655	0.334	1.286
GTV dose (Gy)		0.336			
< 56	14.7		1.000		
≥ 56	85.3		1.660	0.591	4.66
CTV dose					
< 50					
≥ 50					
Concurrent chemotherapy		0.126			
No	53.3		1.000		
Yes	46.7		1.678	0.864	3.258
Chemotherapy agent		0.006			
No agent	53.3		1.000		
Single agent	38.0		1.176	0.567	2.438
Double agent	8.7		6.111	1.991	18.753

OR: odds ratio, *CI*:confidence interval, *p* values less than 0.05 are highlighted in bold.

Supplemental table 3. Univariate logistic regression analysis of prognostic factors influencing Toxicities of Gastrointestinal reaction of elderly esophageal cancer

Variables	%	P	OR	95% CI	
				Lower	Upper
Age		0.558			
< 75	43.5		1.000		
≥ 75	56.5		0.747	0.282	1.979
Sex		0.458			
Male	63.6		1.000		
Female	36.4		1.451	0.543	3.875
Smoking (pack-years)		0.737			
<20	70.1		1.000		
≥20	29.9		1.194	0.424	3.361
Alcohol		0.842			
Not heavy drinking	90.2		1.000		
Heavy drinking	9.8		1.172	0.247	5.564
Comorbidities		0.814			
No	58.2		1.000		
Yes	41.8		1.125	0.422	2.995
ECOG performance status		0.457			
0-1	89.1		1.000		
2-3	10.9		0.455	0.057	3.616
Weight loss before therapy		0.210			
<5	66.3		1.000		
≥5	33.7		2.172	0.645	7.315
Weight loss during therapy		0.887			
<5	80.0		1.000		
≥5	20.0		1.104	0.282	4.314
Primary tumor location		0.491			
Upper-middle	47.8		1.000		
Middle-lower	52.2		0.709	0.267	1.886
Primary tumor length		0.852			
< 6.5cm	35.3		1.000		
≥ 6.5cm	64.7		1.103	0.394	3.090
AJCC Stage		0.241			
I - II	22.3		1.000		
III	77.7		0.534	0.187	1.525
T stage		0.477			
1-2	16.3		1.000		
3-4	83.7		0.65	0.198	2.131
N stage		0.776			

0-1	58.7		1.000		
2-3	41.3		1.153	0.433	3.071
Radiotherapy technique		0.943			
IMRT	60.3		1.000		
VMAT	39.7		0.964	0.356	2.614
CTVnd delineation		0.949			
IFI	77.2		1.000		
ENI	22.8		0.962	0.299	3.097
Dose boost schemes		0.739			
Sequential boost	35.3		1.000		
SIB	64.7		0.844	0.310	2.294
Fraction dose (Gy)		0.295			
≤ 2	54.9		1.000		
> 2	45.1		0.578	0.207	1.613
GTV dose (Gy)		0.108			
< 56	14.7		1.000		
≥ 56	85.3		0.397	0.129	1.223
CTV dose					
< 50					
≥ 50					
Concurrent chemotherapy		0.010			
No	53.3		1.000		
Yes	46.7		4.569	1.443	14.472
Chemotherapy agent		<0.001			
No agent	53.3		1.000		
Single agent	38.0		1.424	0.344	5.899
Double agent[#]	8.7		39.167	9.436	162.564

OR: odds ratio, **CI:** confidence interval, *p* values less than 0.05 are highlighted in bold.

Multivariate analysis showed Double agent was the only independent predictor (p<0.05).