



Comprehensive Registry of Esophageal Cancer in Japan, 2011

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Preface 2011

We deeply appreciate the great contributions of many physicians in the registry of esophageal cancer cases. The Comprehensive Registry of Esophageal Cancer in Japan, 2011, was published here, despite some delay. The registry complies with the Act for the Protection of Personal Information. The encryption with an HASH function is used for anonymity in an unlinkable fashion.

We briefly summarized the Comprehensive Registry of Esophageal Cancer in Japan, 2011. Japanese Classification of Esophageal Cancer 10th and UICC TNM Classification 7th were used for cancer staging according to the subjected year. A total of 6993 cases were registered from 300 institutions in Japan. Tumor locations were cervical: 4.5%, upper thoracic: 13.0%, middle thoracic: 47.8%, lower thoracic: 27.2%, and EG junction: 7.1%. Superficial carcinomas (Tis,

T1a, and T1b) were 36.4%. For the histologic type of biopsy specimens, squamous cell carcinoma and adenocarcinoma accounted for 88.3 and 5.3%, respectively. Regarding clinical results, the 5-year survival rates of patients treated using endoscopic resection, concurrent chemoradiotherapy, radiotherapy alone, or esophagectomy were 86.0, 28.1, 26.5, and 54.5%, respectively. The endoscopic submucosal dissection accounted for 78.1% of endoscopic resection. Esophagectomy was performed in 4147 cases. Concerning the approach used for esophagectomy, 33.5% of the cases were treated thoracoscopically. The operative mortality (within 30 days after surgery) was 0.65% and the hospital mortality was 3.76%. The 5-year survival rate of patients with pStage IV in UICC classification (including patients with supraclavicular node metastasis) was better than that of patients with pStage IVb in JES classification (not including patients with supraclavicular node metastasis).

We hope that this Comprehensive Registry of Esophageal Cancer in Japan for 2011 will help to improve all aspects of the diagnosis and treatment of esophageal cancer in Japan.

These data were first made available on March 2018, as the Comprehensive Registry of Esophageal Cancer in Japan, 2011. Not all the pages are reprinted here.

The authors were members of the Registration Committee for Esophageal Cancer, the Japan Esophageal Society, and made great contributions to the preparation of this material.

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I. Clinical factors of esophageal cancer patients treated in 2011

Institution-registered cases in 2011

Institution
Ageo Central General Hospital
Aichi Cancer Center
Aichi Medical University Hospital
Aizawa Hospital
Akita Kouseiren Hiraga Hospital
Akita University Hospital
Arao Municipal Hospital
Asahikawa Medical College Hospital
Asahikawa-Kosei General Hospital
Chiba Cancer Center
Chiba Medical Center
Chiba Prefectural Sawara Hospital
Chiba University Hospital
Chigasaki Municipal Hospital
Dokkyo Medical University Hospital
Dokkyo Medical University Saitama Medical Center
Eiju General Hospital
Foundation for Detection of Early Gastric Carcinoma
Fuchu Hospital
Fujioka General Hospital
Fujisawa Shounandai Hospital
Fujita Health University
Fukui Prefectural Hospital
Fukui University Hospital
Fukui-ken Saiseikai Hospital
Fukuoka Dental College and Dental Hospital
Fukuoka Saiseikai General Hospital
Fukuoka University Chikushi Hospital
Fukuoka University Hospital
Fukuoka Wajiro Hospital
Fukushima Medical University Hospital
Fukuyama City Hospital
Fussa Hospital
Gifu Prefectural General Medical Center
Gifu University Hospital
Gunma Central General Hospital
Gunma Prefectural Cancer Center
Gunma University Hospital
Gunmaku Saiseikai Maebashi Hospital
Hachinohe City Hospital
Hakodate Goryokaku Hospital
Hakodate National Hospital
Hamamatsu University School of Medicine, University Hospital
Hannan Chuo Hospital
Heartlife Hospital

Continued

Institution
Higashiosaka City Medical Center
Hino Memorial Hospital
Hino Municipal Hospital
Hiratsuka City Hospital
Hiratsuka Kyosai Hospital
Hirosaki University Hospital
Hiroshima City Asa Hospital
Hiroshima City Hiroshima Citizens Hospital
Hiroshima Red Cross Hospital and Atomic-bomb Survivors Hospital
Hiroshima University Hospital
Hitachi General Hospital
Hofu Institute of Gastroenterology
Hokkaido University Hospital
Hyogo Cancer Center
Hyogo College of Medicine
Hyogo Prefectural Nishinomiya Hospital
Ibaraki Prefectural Central Hospital
Iizuka Hospital
Imazu Surgical Clinic
Inazawa City Hospital
International University of Health and Welfare Hospital
International Goodwill Hospital
Isehara Kyodo Hospital
Ishikawa Prefectural Central Hospital
Iwakuni Medical Center
Iwate Medical University Hospital
Iwate Prefectural Chubu Hospital
Iwate Prefectural Isawa Hospital
Japanese Red Cross Fukui Hospital
Japanese Red Cross Ishinomaki Hospital
Japanese Red Cross Kyoto Daini Hospital
Japanese Red Cross Nagaoka Hospital
Japanese Red Cross Okayama Hospital
JCHO Kyushu Hospital
JCHO Osaka Hospital
Jichi Medical University Hospital
Jichi Medical University Saitama Medical Center
Juntendo University Hospital
Juntendo University Shizuoka Hospital
Kagawa Prefectural Central Hospital
Kagawa Rosai Hospital
Kagawa University Hospital
Kagoshima Kenritsu Satsunan Hospital
Kagoshima University Hospital
Kameda General Hospital
Kanagawa Cancer Center
Kanazawa Medical University Hospital
Kanazawa University Hospital
Kansai Medical University Hospital
Kansai Rosai Hospital

Continued

Institution

Kasamatsu Hospital
 Kashiwa Kousei General Hospital
 Kawasaki Medical School Hospital
 Kawasaki Medical School Kawasaki Hospital
 Kawasaki Municipal Ida Hospital
 Nara Hospital Kinki University Faculty of Medicine
 Nara Medical University Hospital
 National Cancer Center Hospital
 National Cancer Center Hospital East
 National Center for Global Health and Medicine
 National Defense Medical College Hospital
 National Hospital Organization Beppu Medical Center
 National Hospital Organization Chiba Medical Center
 National Hospital Organization Chiba-East-Hospital
 National Hospital Organization Fukuoka-higashi Medical Center
 National Hospital Organization Hokkaido Cancer Center
 National Hospital Organization Iwakuni Medical Center
 National Hospital Organization Kanmon Medical Center
 National Hospital Organization Kure Medical Center
 National Hospital Organization Kyoto Medical Center
 National Hospital Organization Kyushu Cancer Center
 National Hospital Organization Matsumoto Medical Center
 National Hospital Organization Nagasaki Medical Center
 National Hospital Organization Nagoya Medical Center
 National Hospital Organization Okayama Medical Center
 National Hospital Organization Osaka National Hospital
 National Hospital Organization Tokyo Medical Center
 Niigata Cancer Center Hospital
 Niigata City General Hospital
 Niigata Prefectural Shibata Hospital
 Niigata University Medical and Dental Hospital
 Nikko Memorial Hospital
 Nippon Medical School Chiba Hokusoh Hospital
 Nippon Medical School Hospital
 Nippon Medical School Musashi Kosugi Hospital
 Nippon Medical School Tama Nagayama Hospital
 Nishi-Kobe Medical Center
 Nishinomiya Municipal Central Hospital
 NTT WEST Osaka Hospital
 Numazu City Hospital
 Obihiro Kousei General Hospital
 Ogaki Municipal Hospital
 Ohta General Hospital Foundation Ohta Nishinouchi Hospital
 Oita Red Cross Hospital
 Oita University Hospital
 Okayama Saiseikai General Hospital
 Okayama University Hospital
 Osaka City University Hospital
 Osaka Hospital of Japan Seafarers relief Association
 Osaka International Cancer Institute
 Osaka Medical College Hospital

Continued

Institution

Osaka Police Hospital
 Osaka Prefectural Hospital Organization Osaka General Medical Center
 Osaka Red Cross Hospital
 Osaka University Hospital
 Otsu City Hospital
 Otsu Red Cross Hospital
 Rinku General Medical Center
 Ryukyu University Hospital
 Saga University Hospital
 Saga-ken Medical Center Koseikan
 Saiseikai Fukushima General Hospital
 Saiseikai Kyoto Hospital
 Saiseikai Utsunomiya Hospital
 Saiseikai Yahata General Hospital
 Saitama Cancer Center
 Saitama City Hospital
 Saitama Medical Center
 Saitama Medical University Hospital
 Saitama Medical University Saitama Medical Center
 Sakai City Medical Center
 Saku Central Hospital
 Sanin Rosai Hospital
 Sano Kousei General Hospital
 Sato Clinic
 Sendai City Hospital
 Sendai Medical Center
 Shiga University of Medical Science Hospital
 Shikoku Cancer Center
 Shimane University Hospital
 Shimizu Welfare Hospital
 Shin Beppu Hospital
 Shinko Hospital
 Shizuoka Cancer Center
 Shizuoka City Shizuoka Hospital
 Shizuoka General Hospital
 Showa University Fujigaoka Hospital
 Showa University Hospital
 Showa University Koto-Toyosu Hospital
 Social Insurance Omuta Tenryo Hospital
 Social Insurance Tagawa Hospital
 St. Marianna University School of Medical Hospital
 St. Luke's International Hospital
 Sugita Genpaku Memorial Obama Municipal Hospital
 Suita Municipal Hospital
 Takasago Municipal Hospital
 Teikyo University Chiba Medical Center
 Teikyo University Hospital
 Tenri Hospital
 The Cancer Institute Hospital of JFCR
 The Jikei University Daisan Hospital

Continued

Institution
The Jikei University Hospital
The Research Center Hospital for Charged Particle Therapy of NIRS
Tochigi Cancer Center
Toho University Ohashi Medical Center
Toho University Omori Medical Center
Toho University Sakura Medical Center
Tohoku Kosai Hospital
Tohoku University Hospital
Tokai University Hachioji Hospital
Tokai University Hospital
Tokai University Tokyo Hospital
Tokushima Red Cross Hospital
Tokushima University Hospital
Tokuyama Central Hospital
Tokyo Dental College Ichikawa General Hospital
Tokyo Medical and Dental University Hospital
Tokyo Medical University Hospital
Tokyo Medical University Ibaraki Medical Center
Tokyo Metropolitan Cancer and Infectious Diseases Center Komagome Hospital
Tokyo Metropolitan Health and Medical Corporation Toshima Hospital
Tokyo Metropolitan Tama Medical Center
Tokyo Saiseikai Central Hospital
Tokyo University Hospital
Tokyo Women's Medical University Hospital
Tokyo Women's Medical University Medical Center East
Tokyo Women's Medical University Yachiyo Medical Center
Tonan Hospital
Tone Chuo Hospital
Toranomon Hospital
Tottori Prefectural Central Hospital
Tottori University Hospital
Toyama Prefectural Central Hospital
Toyama University Hospital
Toyonaka Municipal Hospital
Tsuchiura Kyodo Hospital
Tsukuba University Hospital
Tsuruoka Municipal Shonai Hospital
University Hospital, Kyoto Prefectural University of Medicine
University of Miyazaki Hospital
Urasoe General Hospital
Wakayama Medical University Hospital
Yamagata Prefectural and Sakata Municipal Hospital Organization
Yamagata Prefectural Central Hospital
Yamagata Prefectural Shinjo Hospital
Yamagata University Hospital
Yamaguchi University Hospital
Yamaguchi-ken Saiseikai Shimonoseki General Hospital
Yamanashi Prefectural Central Hospital
Yamanashi University Hospital

Continued

Institution
Yao Municipal Hospital
Yokohama Chuo Hospital
Yokohama City Municipal Hospital
Yokohama City University Medical Center
Yokohama Rosai Hospital

(Total 300 institutions)

Patient background

Table 1 Age and gender

Age	Male	Female	Cases (%)
≤29	4	1	5 (0.1%)
30–39	22	8	30 (0.4%)
40–49	142	47	189 (2.7%)
50–59	878	173	1051 (15.0%)
60–69	2531	360	2891 (41.3%)
70–79	1941	333	2274 (32.5%)
80–89	442	90	532 (7.6%)
90–	13	8	21 (0.3%)
Total	5973	1020	6993

Table 2 Primary treatment

Treatments	Cases (%)
Surgery	4236 (60.7%)
Esophagectomy	4147 (59.4%)
Palliative surgery	89 (1.3%)
Chemotherapy/radiotherapy	1549 (22.2%)
Endoscopic treatment	1198 (17.2%)
Total	6983

Table 3 Tumor location

Location of tumor	Endoscopic treatment (%)	Surgery		Chemotherapy and/or radiotherapy (%)	Total (%)
		Esophagectomy (%)	Palliative surgery (%)		
Cervical	33 (2.8%)	127 (3.1%)	4 (4.5%)	147 (9.5%)	311 (4.5%)
Upper thoracic	116 (9.7%)	517 (12.5%)	18 (20.2%)	256 (16.5%)	907 (13.0%)
Middle thoracic	687 (57.3%)	1873 (45.2%)	46 (51.7%)	732 (47.3%)	3338 (47.8%)
Lower thoracic	296 (24.7%)	1235 (29.8%)	20 (22.5%)	345 (22.3%)	1896 (27.2%)
EG	41 (3.4%)	300 (7.2%)	0	36 (2.3%)	377 (5.4%)
E=G	9 (0.8%)	47 (1.1%)	0	1 (0.1%)	57 (0.8%)
GE	5 (0.4%)	40 (1.0%)	1 (1.1%)	2 (0.1%)	48 (0.7%)
Unknown	11 (0.9%)	8 (0.2%)	0	30 (1.9%)	49 (0.7%)
Total	1198	4147	89	1549	6983

E esophageal, G gastric

Table 4 Histologic types of biopsy specimens

Histologic types	Cases (%)
Squamous cell carcinoma	6164 (88.3%)
Squamous cell carcinoma	4369 (62.6%)
Well differentiated	378 (5.4%)
Moderately differentiated	1054 (15.1%)
Poorly differentiated	363 (5.2%)
Adenocarcinoma	281 (4.0%)
Barrett's adenocarcinoma	90 (1.3%)
Adenosquamous carcinoma	15 (0.2%)
Mucoepidermoid carcinoma	4 (0.1%)
Basaloid carcinoma	35 (0.5%)
Neuroendocrine cell tumor	26 (0.4%)
Undifferentiated carcinoma	8 (0.1%)
Sarcoma	6 (0.1%)
Malignant melanoma	19 (0.3%)
Carcinosarcoma	22 (0.3%)
GIST	7 (0.1%)
Other tumors	92 (1.3%)
Unknown	214 (3.1%)
Total	6983

Table 5 Depth of tumor invasion, cT (UICC TNM 7th)

cT	Cases (%)
cTX	71 (1.0%)
cT0	10 (0.1%)
cTis	198 (2.8%)
cT1a	1051 (15.1%)
cT1b	1292 (18.5%)
cT2	905 (13.0%)
cT3	2408 (34.5%)
cT4a	384 (5.5%)
cT4b	530 (7.6%)
Unknown	134 (1.9%)
Total	6983

Table 6 Lymph node metastasis, cN (UICC TNM 7th)

cN	Cases (%)
cNX	187 (2.7%)
cN0	3195 (45.8%)
cN1	1864 (26.7%)
cN2	1199 (17.2%)
cN3	459 (6.6%)
Unknown	79 (1.1%)
Total	6983

Table 7 Distant metastasis, cM (UICC TNM 7th)

cM	Cases (%)
cM0	6128 (87.8%)
cM1	722 (10.3%)
Unknown	133 (1.9%)
Total	6983

Table 8 Clinical stage (UICC TNM 7th)

Clinical stage	Endoscopic treatment (%)	Surgery		Chemotherapy and/or radiotherapy (%)	Total (%)
		Esophagectomy (%)	Palliative surgery (%)		
Stage 0	151 (12.6%)	15 (0.4%)	0	7 (0.5%)	173 (2.5%)
Stage IA	809 (67.5%)	937 (22.6%)	1 (1.1%)	161 (10.4%)	1908 (27.3%)
Stage IB	2 (0.2%)	363 (8.8%)	1 (1.1%)	58 (3.7%)	424 (6.1%)
Stage IIA	3 (0.3%)	419 (10.1%)	3 (3.4%)	60 (3.9%)	485 (6.9%)
Stage IIB	4 (0.3%)	470 (11.3%)	1 (1.1%)	63 (4.1%)	538 (7.7%)
Stage IIIA	10 (0.8%)	898 (21.7%)	14 (15.7%)	147 (9.5%)	1069 (15.3%)
Stage IIIB	6 (0.5%)	456 (11.0%)	9 (10.1%)	99 (6.4%)	570 (8.2%)
Stage IIIC	32 (2.7%)	292 (7.0%)	27 (30.3%)	390 (25.2%)	741 (10.6%)
Stage IV	40 (3.3%)	165 (4.0%)	25 (28.1%)	434 (28.0%)	664 (9.5%)
Unknown	141 (11.8%)	132 (3.2%)	8 (9.0%)	130 (8.4%)	411 (5.9%)
Total	1198	4147	89	1549	6983

II. Results of endoscopically treated patients in 2011

Table 9 Details of endoscopic treatment for curative intent

Treatment details	Cases (%)
EMR	190 (17.9%)
EMR + YAG laser	13 (1.2%)
ESD	829 (78.1%)
ESD + EMR	5 (0.5%)
ESD + PDT	0
ESD + YAG laser	5 (0.5%)
PDT	2 (0.2%)
YAG laser	18 (1.7%)
Total	1062

EMR endoscopic mucosal resection, *ESD* endoscopic submucosal dissection, *YAG* yttrium aluminum garnet, *PDT* photodynamic therapy

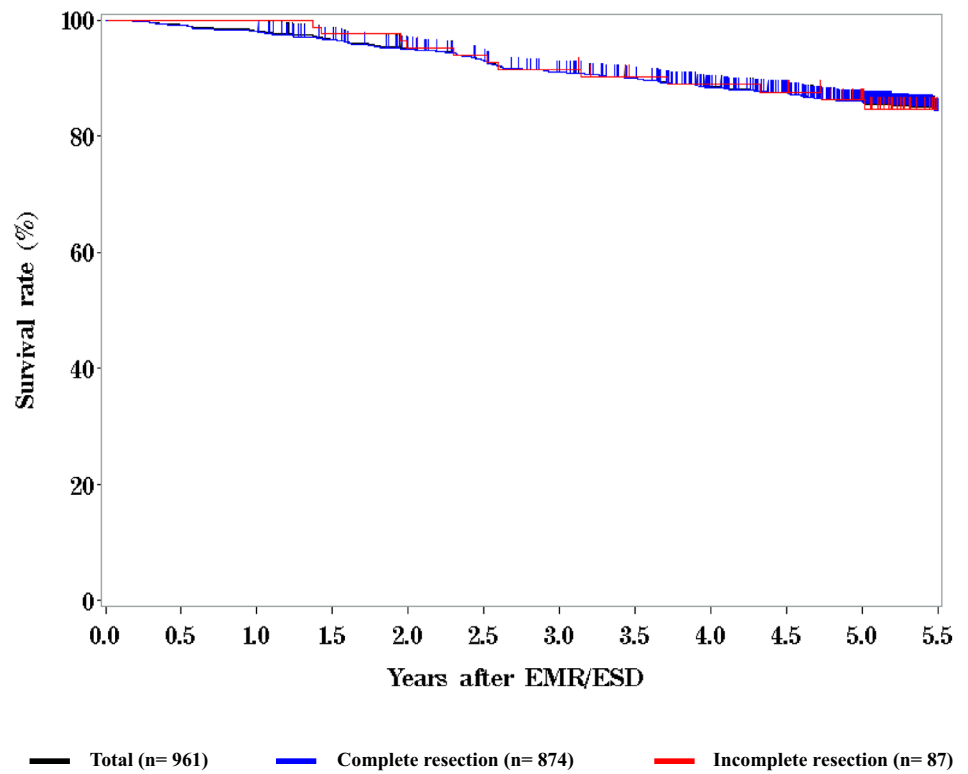
Table 10 Complications of EMR/ESD

Complications of EMR/ESD	Cases (%)
None	969 (93.0%)
Perforation	13 (1.2%)
Bleeding	3 (0.3%)
Mediastinitis	3 (0.3%)
Stenosis	49 (4.7%)
Others	4 (0.4%)
Total	1042

Table 11 Pathological depth of tumor invasion of EMR/ESD specimens

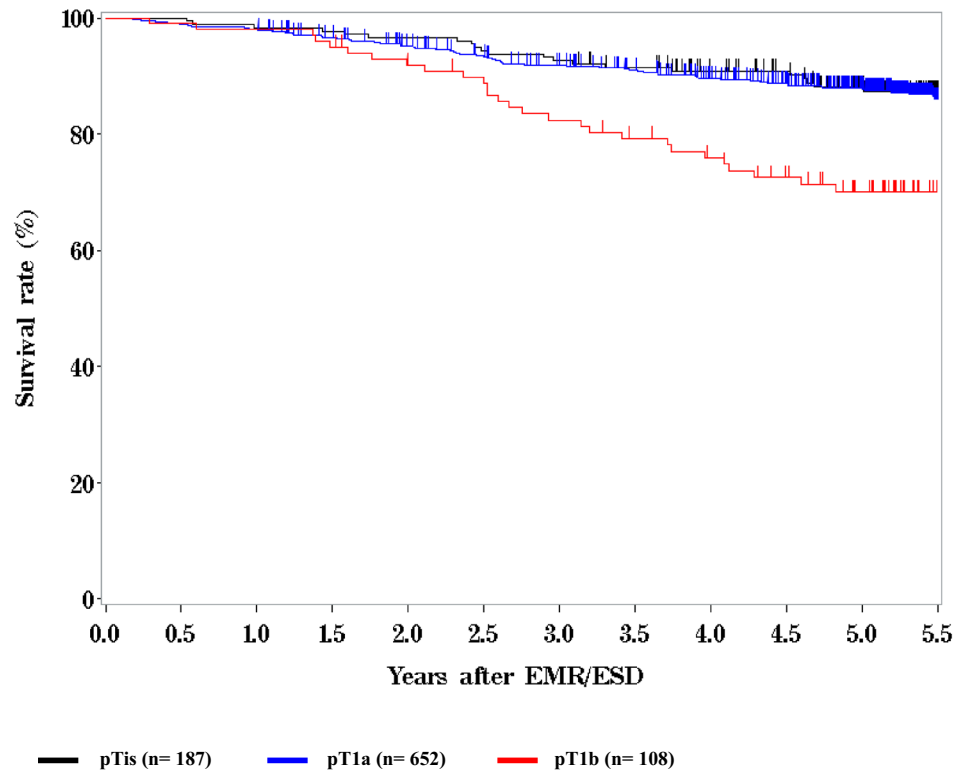
Pathological depth of tumor invasion (pT)	Cases (%)
pTX	3 (0.3%)
pT0	7 (0.7%)
pTis	201 (19.3%)
pT1a	703 (67.5%)
pT1b	114 (10.9%)
pT2	3 (0.3%)
Unknown	11 (1.1%)
Total	1042

Fig. 1 Survival of patients treated with EMR/ESD



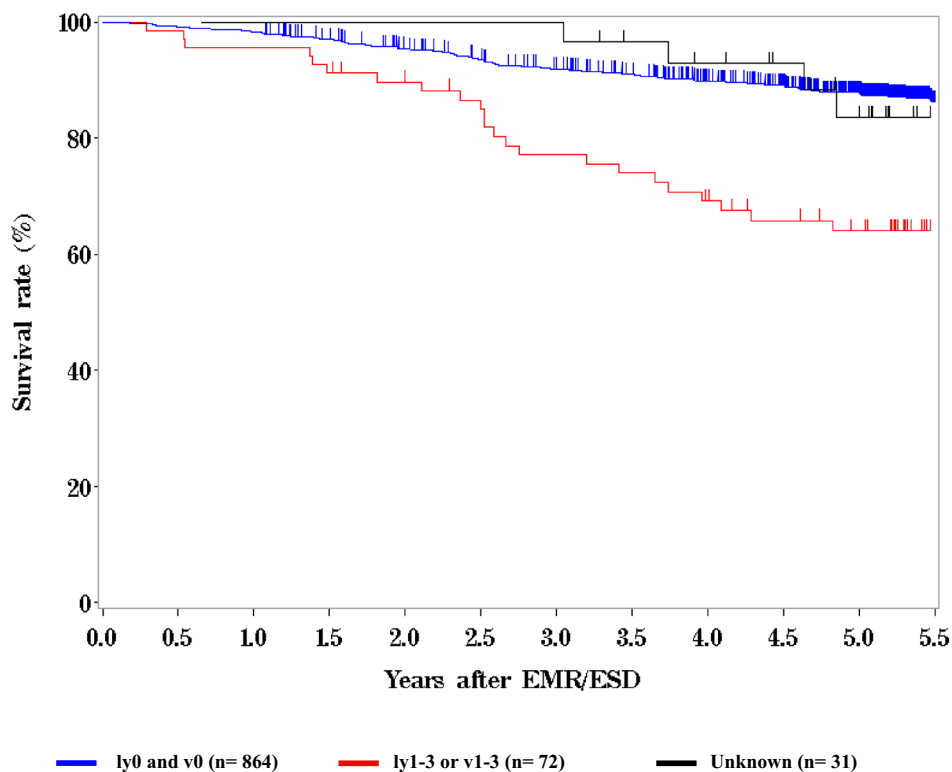
	Years after EMR/ESD				
	1	2	3	4	5
Total	98.2%	95.0%	91.0%	88.4%	86.0%
Complete resection	98.0%	95.0%	91.0%	88.4%	86.0%
Incomplete resection	100.0%	95.1%	91.4%	88.9%	86.2%

Fig. 2 Survival of patients treated with EMR/ESD according to the pathological depth of tumor invasion (pT)



	Years after EMR/ESD				
	1	2	3	4	5
pTis	98.3%	96.6%	92.6%	90.9%	88.1%
pT1a	98.1%	95.1%	91.9%	89.6%	88.0%
pT1b	98.0%	91.9%	82.4%	75.9%	70.1%

Fig. 3 Survival of patients treated with EMR/ESD according to the lymphatic and venous invasion



	Years after EMR/ESD				
	1	2	3	4	5
ly0 and v0	98.3%	95.3%	91.9%	89.8%	87.9%
ly1-3 or v1-3	95.6%	89.7%	77.1%	69.2%	64.0%
Unknown	100.0%	100.0%	100.0%	92.8%	83.5%

III. Results in patients treated with chemotherapy and/or radiotherapy in 2011

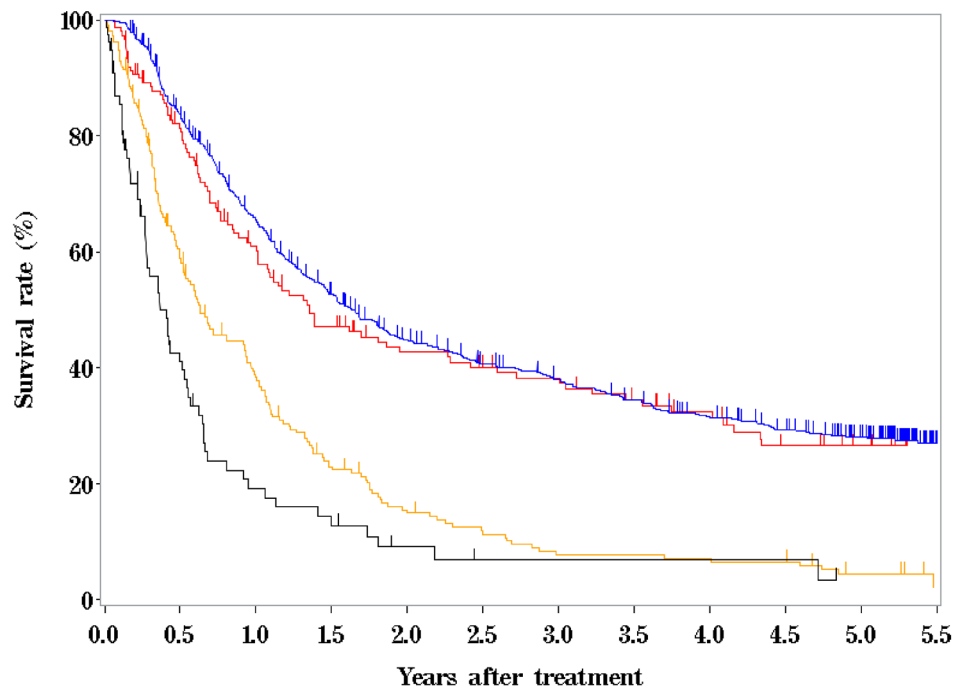
Table 12 Dose of irradiation (non-surgically treated cases)

Dose of irradiation (Gy)	Definitive		Palliative (%)	Recurrence (%)	Others (%)	Unknown (%)	Total (%)
	Radiation alone (%)	Chemoradiotherapy (%)					
–29	6 (3.5%)	13 (1.7%)	32 (10.9%)	0	2 (5.7%)	0	53 (4.1%)
30–39	4 (2.3%)	17 (2.2%)	40 (13.6%)	0	2 (5.7%)	0	63 (4.9%)
40–49	8 (4.6%)	33 (4.2%)	34 (11.6%)	0	10 (28.6%)	0	85 (6.6%)
50–59	29 (16.8%)	177 (22.7%)	71 (24.1%)	1 (25.0%)	11 (31.4%)	1 (50.0%)	290 (22.5%)
60–69	116 (67.1%)	516 (66.1%)	108 (36.7%)	3 (75.0%)	9 (25.7%)	0	752 (58.3%)
70–	9 (5.2%)	12 (1.5%)	3 (1.0%)	0	1 (2.9%)	0	25 (2.2%)
Unknown	1 (0.6%)	13 (1.7%)	6 (2.0%)	0	0	1 (50.0%)	21 (1.6%)
Total	173	781	294	4	35	2	1289
Median (min–max)	60.0 (4.4–70.0)	60.0 (1.8–120.0)	50.4 (3.6–159.0)	60.0 (50.0–61.2)	50.0 (21.6–109.0)	54.0 (54.0–54.0)	60.0 (1.8–105.0)

Table 13 Dose of irradiation (surgically treated cases)

Dose of irradiation (Gy)	Preoperative irradiation (%)	Postoperative irradiation (%)
–29	5 (2.2%)	3 (6.0%)
30–39	39 (17.1%)	0
40–49	156 (68.4%)	8 (16.0%)
50–59	15 (6.6%)	15 (30.0%)
60–69	6 (2.6%)	15 (30.0%)
70–	1 (0.4%)	0
Unknown	6 (2.6%)	9 (18.0%)
Total	228	50
Median (min–max)	40.0 (1.8–70.0)	50.4 (2.0–66.0)

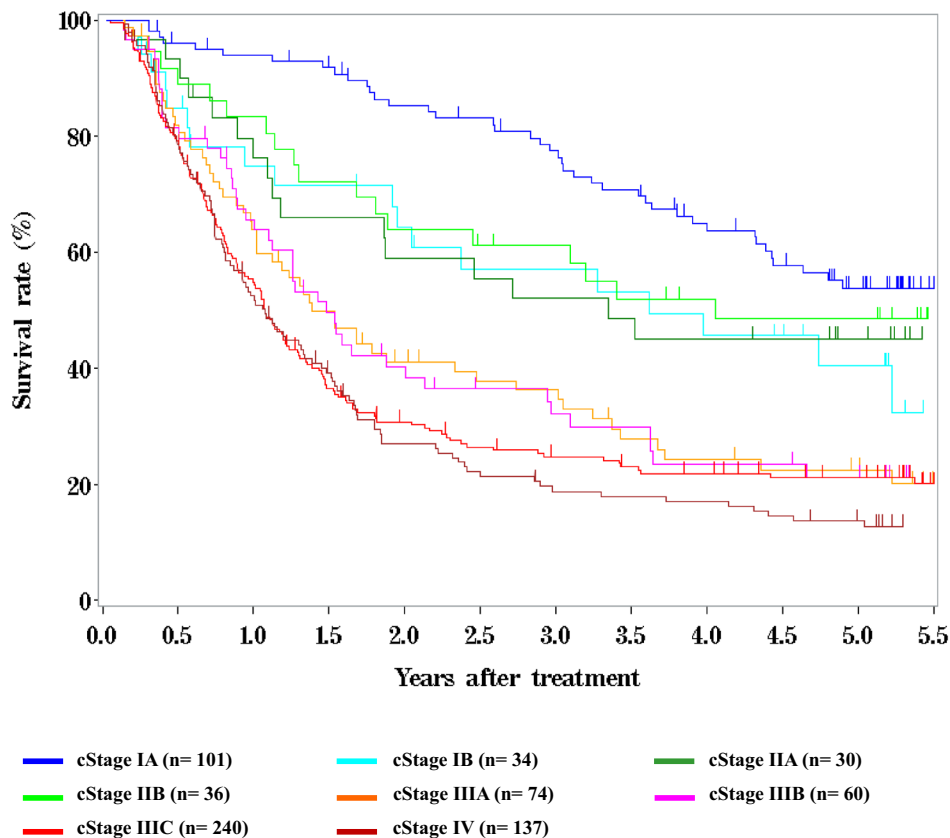
Fig. 4 Survival of patients treated with chemotherapy and/or radiotherapy



— Chemoradiotherapy (n= 731) — Radiotherapy alone (n= 150)
— Chemotherapy alone (n= 211) — Palliative Radiotherapy (n= 77)

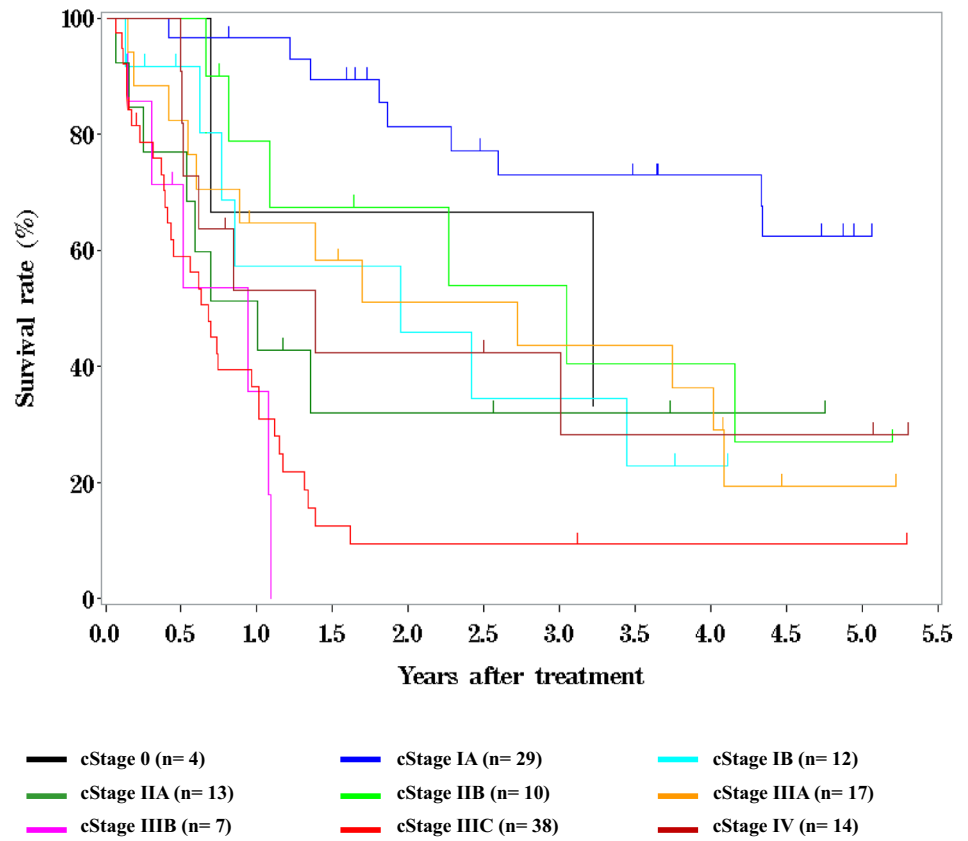
	Years after treatment				
	1	2	3	4	5
Chemoradiotherapy	65.6%	44.8%	37.9%	31.5%	28.1%
Radiotherapy alone	60.9%	42.7%	38.2%	32.4%	26.5%
Chemotherapy alone	38.3%	14.9%	7.8%	7.2%	4.4%
Palliative radiotherapy	19.1%	9.1%	6.8%	6.8%	-

Fig. 5 Survival of patients treated with definitive chemoradiotherapy according to clinical stage (UICC TNM 7th)



	Years after treatment				
	1	2	3	4	5
cStage IA	93.9%	85.3%	77.5%	63.8%	53.8%
cStage IB	74.9%	64.3%	57.0%	45.6%	40.5%
cStage IIA	76.3%	58.9%	52.0%	45.1%	45.1%
cStage IIB	83.3%	63.9%	61.1%	51.9%	48.5%
cStage IIIA	63.9%	41.2%	36.2%	24.3%	22.5%
cStage IIIB	65.6%	40.3%	32.2%	23.6%	21.2%
cStage IIIC	54.8%	30.8%	24.8%	21.9%	21.2%
cStage IV	52.4%	27.1%	18.8%	17.1%	13.7%

Fig. 6 Survival of patients underwent radiotherapy alone according to clinical stage (UICC TNM 7th)



	Years after treatment				
	1	2	3	4	5
cStage 0	66.7%	66.7%	66.7%	33.3%	33.3%
cStage IA	96.6%	81.3%	72.9%	72.9%	62.5%
cStage IB	57.3%	45.8%	34.4%	22.9%	-
cStage IIA	51.3%	32.1%	32.1%	32.1%	-
cStage IIB	78.8%	67.5%	54.0%	40.5%	27.0%
cStage IIIA	64.7%	51.0%	43.7%	36.4%	19.4%
cStage IIIB	35.7%	-	-	-	-
cStage IIIC	36.5%	9.7%	9.7%	9.7%	9.7%
cStage IV	53.0%	42.4%	42.4%	28.3%	28.3%

IV. Results in patients who underwent esophagectomy in 2011

Table 14 Treatment modalities of esophagectomy

Treatments	Cases (%)
Esophagectomy alone	1699 (41.2%)
Esophagectomy + endoscopic treatment	89 (2.2%)
Esophagectomy + chemoradiotherapy	590 (14.3%)
Concurrent chemoradiotherapy	370 (9.0%)
Other	220 (5.3%)
Esophagectomy + chemoradiotherapy + endoscopic treatment	21 (0.5%)
Esophagectomy + chemotherapy	1657 (40.2%)
Preoperative	1295 (31.4%)
Postoperative	198 (4.8%)
Preoperative and postoperative	57 (1.4%)
Recurrence	107 (2.6%)
Other	20 (0.5%)
Esophagectomy + chemotherapy + endoscopic treatment	1 (0.0%)
Esophagectomy + radiotherapy	67 (1.6%)
Preoperative	17 (0.4%)
Postoperative	13 (0.3%)
Recurrence	5 (0.1%)
Other	32 (0.8%)
Esophagectomy + radiotherapy + endoscopic treatment	3 (0.1%)
Total	4127

Table 15 Tumor location

Locations	Cases (%)
Cervical	127 (3.1%)
Upper thoracic	517 (12.5%)
Middle thoracic	1873 (45.2%)
Lower thoracic	1235 (29.8%)
E > G	300 (7.2%)
E = G	47 (1.1%)
G > E	40 (1.0%)
Unknown	8 (0.2%)
Total lesions	4147

Table 16 Approaches to tumor resection

Approaches	Cases (%)
Cervical approach	96 (2.3%)
Right thoracic	3459 (83.4%)
Left thoracic	67 (1.6%)
Left thoracoabdominal	72 (1.7%)
Abdominal	172 (4.1%)
Transhiatal thoracic esophagectomy	51 (1.2%)
Transhiatal lower esophagectomy	82 (2.0%)
Sternotomy	9 (0.2%)
Others	33 (0.8%)
Unknown	106 (2.6%)
Total	4147

Thoracic includes thoracotomy and thoroscopic. Abdominal includes laparotomy and laparoscopic

Table 17 Video-assisted surgery

Video-assisted surgery	Cases (%)
None	2389 (57.6%)
Thoracoscopy	768 (18.5%)
Thoracoscopy + Laparoscopy	605 (14.6%)
Thoracoscopy + Laparoscopy + Mediastinoscopy	15 (0.4%)
Thoracoscopy + Mediastinoscopy	2 (0.0%)
Laparoscopy	201 (4.8%)
Laparoscopy + Mediastinoscopy	14 (0.3%)
Laparoscopy + Other	2 (0.0%)
Mediastinoscopy	21 (0.5%)
Others	4 (0.1%)
Total	4147

Table 18 Fields of lymph node dissection according to the location of the tumor

Field of lymphadenectomy	Cervical	Upper thoracic	Middle thoracic	Lower thoracic	E>G	E=G	G>E	Unknown	Total
None	10 (8.6%)	13 (3.2%)	59 (3.5%)	28 (2.7%)	13 (5.4%)			2 (25.0%)	125 (3.5%)
C	36 (31.0%)	10 (2.4%)	20 (1.2%)	3 (0.3%)	1 (0.4%)				70 (2.0%)
C+UM	21 (18.1%)	6 (1.5%)	3 (0.2%)	1 (0.1%)					31 (0.9%)
C+UM+MLM	2 (1.7%)	12 (2.9%)	28 (1.7%)	12 (1.1%)			1 (3.7%)		55 (1.5%)
C+UM+MLM+A	27 (23.3%)	257 (62.5%)	800 (47.9%)	367 (34.8%)	26 (10.8%)	6 (15.8%)		1 (12.5%)	1484 (41.6%)
C+UM+MLM+A+OT				1 (0.1%)					1 (0.0%)
C+UM+A	2 (1.7%)	1 (0.2%)	2 (0.1%)	2 (0.2%)					7 (0.2%)
C+MLM			1 (0.1%)						1 (0.0%)
C+MLM+A	3 (2.6%)	1 (0.2%)	7 (0.4%)	3 (0.3%)					14 (0.4%)
C+A	1 (0.9%)	2 (0.5%)	4 (0.2%)	2 (0.2%)	1 (0.4%)				10 (0.3%)
UM	4 (3.4%)	3 (0.7%)	5 (0.3%)	3 (0.3%)					15 (0.4%)
UM+MLM	1 (0.9%)	7 (1.7%)	29 (1.7%)	12 (1.1%)	1 (0.4%)			1 (12.5%)	51 (1.4%)
UM+MLM+A	3 (2.6%)	75 (18.2%)	627 (37.6%)	478 (45.4%)	56 (23.2%)	5 (13.2%)	1 (3.7%)	1 (12.5%)	1246 (35.0%)
UM+A	1 (0.9%)	4 (1.0%)	2 (0.1%)	2 (0.2%)	2 (0.8%)				11 (0.3%)
MLM		3 (0.7%)	10 (0.6%)	14 (1.3%)	3 (1.2%)				30 (0.8%)
MLM+A	1 (0.9%)	7 (1.7%)	34 (2.0%)	102 (9.7%)	108 (44.8%)	23 (60.5%)	17 (63.0%)		292 (8.2%)
A	1 (0.9%)	6 (1.5%)	22 (1.3%)	12 (1.1%)	28 (11.6%)	3 (7.9%)	8 (29.6%)	1 (12.5%)	81 (2.3%)
Unknown	3 (2.6%)	4 (1.0%)	16 (1.0%)	12 (1.1%)	2 (0.8%)	1 (2.6%)		2 (25.0%)	40 (1.1%)
Total	116	411	1669	1054	241	38	27	8	3564

C bilateral cervical nodes, UM upper mediastinal nodes, MLM middle–lower mediastinal nodes, A abdominal nodes

Table 19 Reconstruction route

Reconstruction route	Cases (%)
None	56 (1.4%)
Subcutaneous	384 (9.3%)
Retrosternal	1437 (34.7%)
Posterior mediastinal	1715 (41.4%)
Intrathoracic	419 (10.1%)
Cervical	35 (0.8%)
Others	34 (0.8%)
Unknown	67 (1.6%)
Total	4147

Table 20 Organs used for reconstruction

Organs used for reconstruction	Cases (%)
None	76 (1.8%)
Whole stomach	63 (1.5%)
Gastric tube	3508 (83.6%)
Jejunum	255 (6.1%)
Free jejunum	76 (1.8%)
Colon	127 (3.0%)
Free colon	13 (0.3%)
Skin graft	1
Others	14 (0.3%)
Unknown	63 (1.5%)
Total organs	4196
Total cases	4147

Table 21 Histological classification

Histological classification	Cases (%)
Squamous cell carcinoma	3502 (84.4%)
Squamous cell carcinoma	732 (17.7%)
Well differentiated	645 (15.6%)
Moderately differentiated	1630 (39.3%)
Poorly differentiated	495 (11.9%)
Adenocarcinoma	210 (5.1%)
Barrett's adenocarcinoma	78 (1.9%)
Adenosquamous carcinoma	31 (0.7%)
Mucoepidermoid carcinoma	3 (0.1%)
Adenoid cystic carcinoma	2 (0.0%)
Basaloid carcinoma	81 (2.0%)
Neuroendocrine cell tumor	15 (0.4%)
Undifferentiated carcinoma	8 (0.2%)
Other carcinoma	9 (0.2%)
Carcinosarcoma	29 (0.7%)
Malignant melanoma	16 (0.4%)
GIST	6 (0.1%)
Other	39 (0.9%)
Unknown	118 (2.8%)
Total	4147

Table 22 Depth of tumor invasion, pT (JES 10th)

pT category	Cases (%)
pTX	57 (1.4%)
pT0	128 (3.1%)
pTis	31 (0.7%)
pT1a	435 (10.5%)
pT1b	1070 (25.8%)
pT2	516 (12.4%)
pT3	1576 (38.0%)
pT4	24 (0.6%)
pT4a	93 (2.2%)
pT4b	89 (2.1%)
Unknown	128 (3.1%)
Total	4147

Table 23 Pathological grading of lymph node metastasis, pN (JES 10th)

Lymph node metastasis	Cases (%)
pN0	1970 (47.5%)
pN1	616 (14.9%)
pN2	949 (22.9%)
pN3	323 (7.8%)
pN4	209 (5.0%)
Unknown	80 (1.9%)
Total	4147

Table 24 Pathological findings of lymph node metastasis, pN (UICC 7th)

Lymph node metastasis	Cases (%)
pN0	1871 (45.1%)
pN1 (1–2)	1165 (28.1%)
pN2 (3–6)	659 (15.9%)
pN3 (7–)	366 (8.8%)
Unknown	86 (2.1%)
Total	4147

Regional lymph nodes are different in JES 10th and UICC 7th
Data for Tables 23 and 24 were analyzed from different variables in the registration application

Table 25 Pathological findings of distant organ metastasis, pM (JES 10th)

Distant metastasis	Cases (%)
pMX	195 (4.7%)
pM0	3886 (93.7%)
pM1	66 (1.6%)
Total	4147

Table 26 Residual tumor

Residual tumor	Cases (%)
RX	147 (3.5%)
R0	3624 (87.4%)
R1	219 (5.3%)
R2	157 (3.8%)
Total	4147

Table 27 Causes of death

Cause of death	Cases (%)
Death due to recurrence	1223 (71.2%)
Death due to other cancer	71 (4.1%)
Death due to other disease (rec+)	42 (2.4%)
Death due to other disease (rec-)	239 (13.9%)
Death due to other disease (rec?)	9 (0.5%)
Operative death*	27 (1.6%)
Postoperative hospital death**	55 (3.2%)
Unknown	51 (3.0%)
Total of death cases	1717

rec: recurrence

*Operative death means death within 30 days after operation in or out of hospital

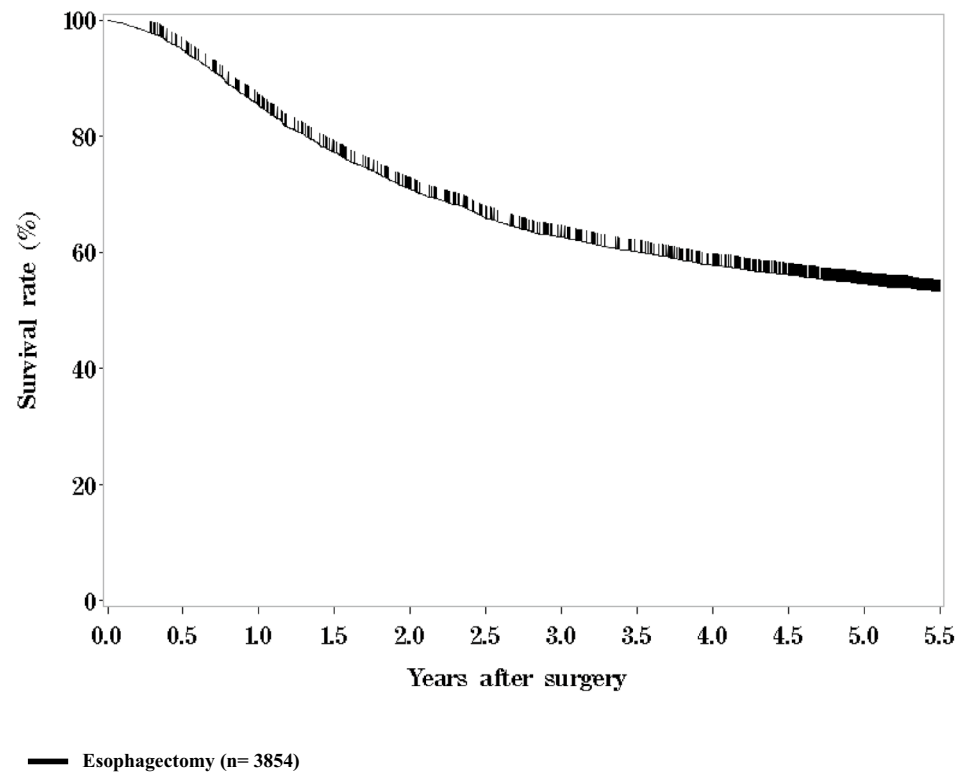
**Hospital death is defined as death during the same hospitalization, regardless of department at time of death

Operative mortality after esophagectomy: 0.65%

Hospital mortality after esophagectomy: 3.76%

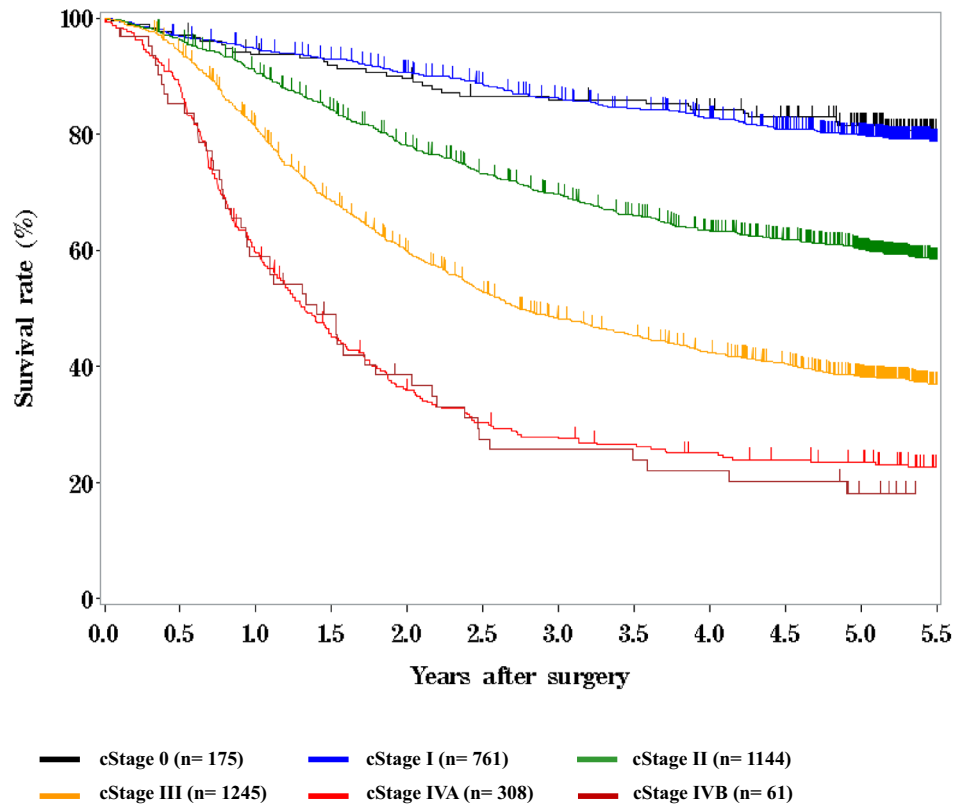
Follow-up period (months)	
Median (min - max)	47.03 (0.03 – 203.3)

Fig. 7 Survival of patients who underwent esophagectomy



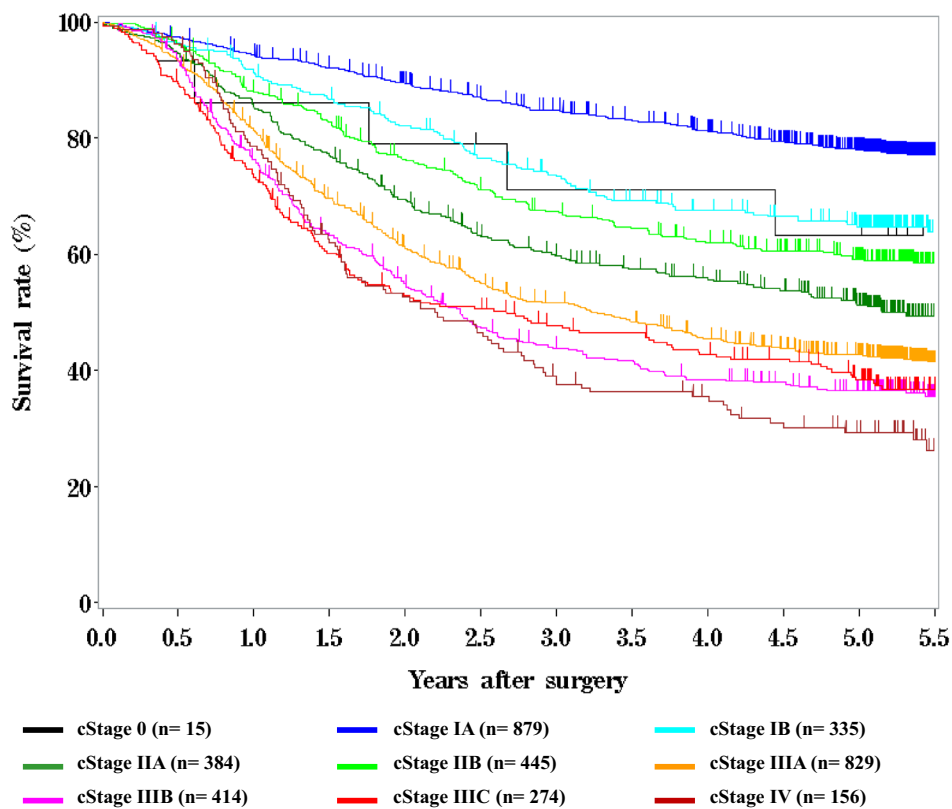
	Years after surgery				
	1	2	3	4	5
Esophagectomy	85.1%	70.8%	62.6%	57.7%	54.5%

Fig. 8 Survival of patients who underwent esophagectomy according to clinical stage (JES 10th)



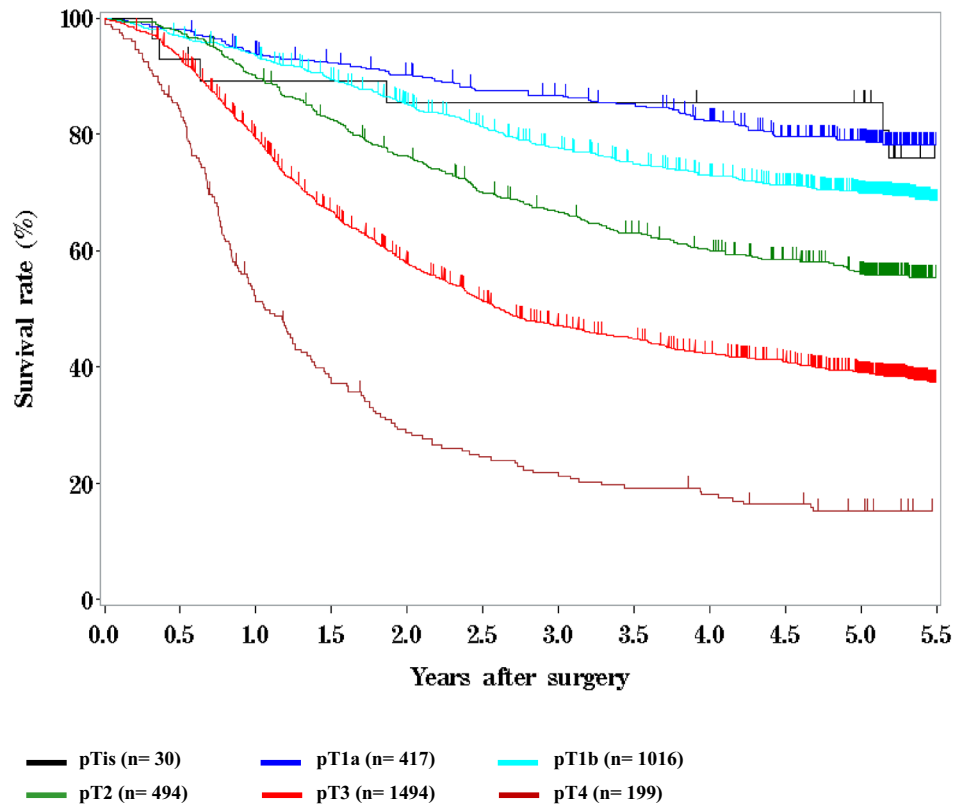
	Years after surgery				
	1	2	3	4	5
cStage 0	93.6%	89.5%	85.9%	84.1%	81.5%
cStage I	94.8%	90.6%	86.3%	82.8%	79.8%
cStage II	90.5%	78.1%	69.6%	63.2%	60.1%
cStage III	81.1%	59.8%	48.2%	42.4%	38.3%
cStage IVA	59.5%	35.9%	27.6%	25.1%	23.6%
cStage IVB	59.0%	38.5%	25.7%	22.0%	18.2%

Fig. 9 Survival of patients who underwent esophagectomy according to clinical stage (UICC 7th)



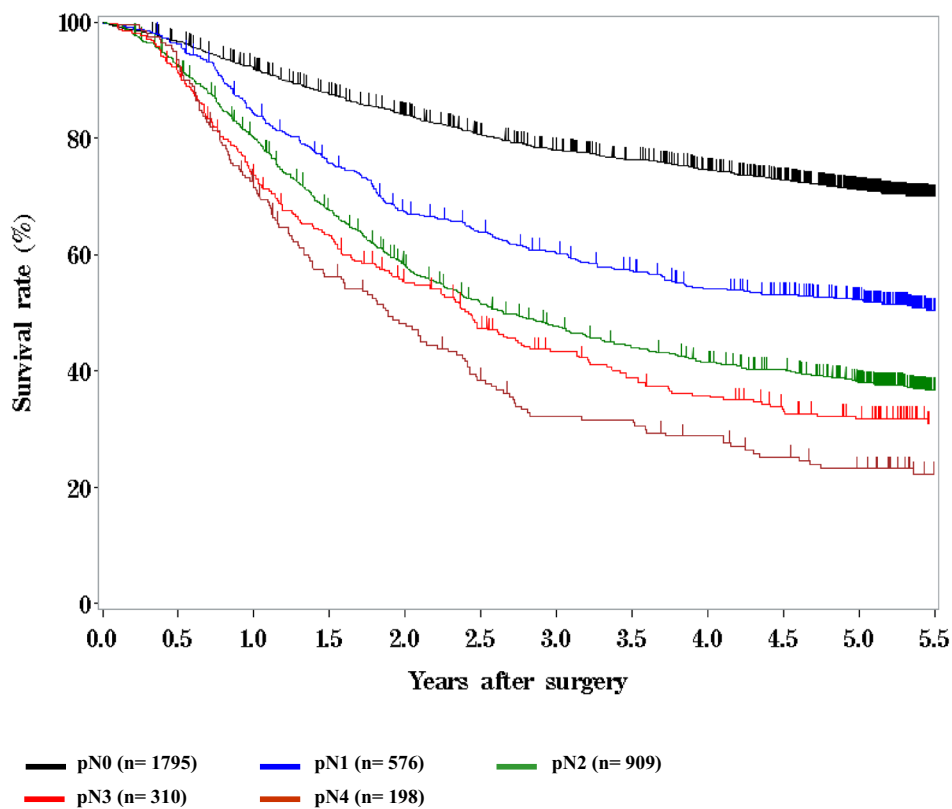
	Years after surgery				
	1	2	3	4	5
cStage 0	86.2%	79.0%	71.2%	71.2%	63.2%
cStage IA	94.3%	89.4%	84.8%	81.1%	78.0%
cStage IB	91.2%	82.1%	73.7%	67.6%	64.8%
cStage IIA	85.4%	69.6%	59.7%	55.6%	51.3%
cStage IIB	88.0%	76.4%	67.4%	62.1%	59.2%
cStage IIIA	81.3%	61.1%	51.6%	45.5%	42.7%
cStage IIIB	76.3%	54.9%	43.8%	38.5%	36.5%
cStage IIIC	73.2%	52.9%	47.8%	42.8%	38.4%
cStage IV	78.5%	52.6%	37.7%	35.5%	29.4%

Fig. 10 Survival of patients who underwent esophagectomy according to the depth of tumor invasion, pT (JES 10th)



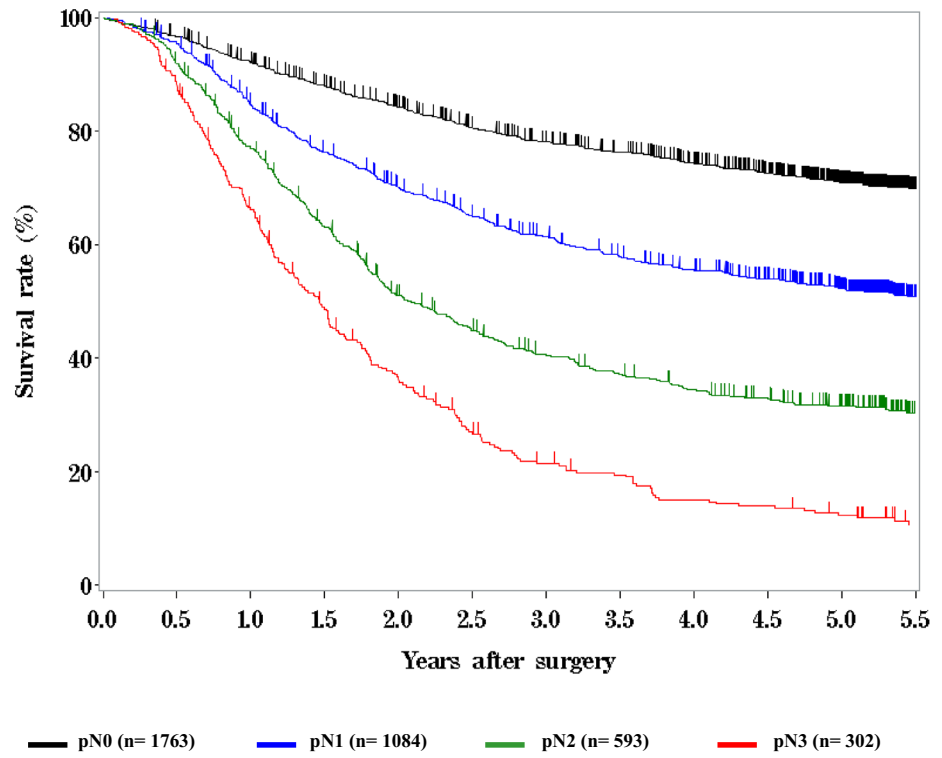
	Years after surgery				
	1	2	3	4	5
pTis	89.1%	89.1%	89.1%	85.4%	85.4%
pT1a	93.9%	90.2%	86.7%	82.3%	79.0%
pT1b	93.5%	85.2%	77.8%	72.9%	70.0%
pT2	89.8%	76.2%	66.6%	59.9%	56.1%
pT3	79.3%	57.8%	47.1%	42.3%	39.0%
pT4	51.3%	28.7%	21.3%	18.1%	15.2%

Fig. 11 Survival of patients who underwent esophagectomy according to lymph node metastasis, pN (JES 10th)



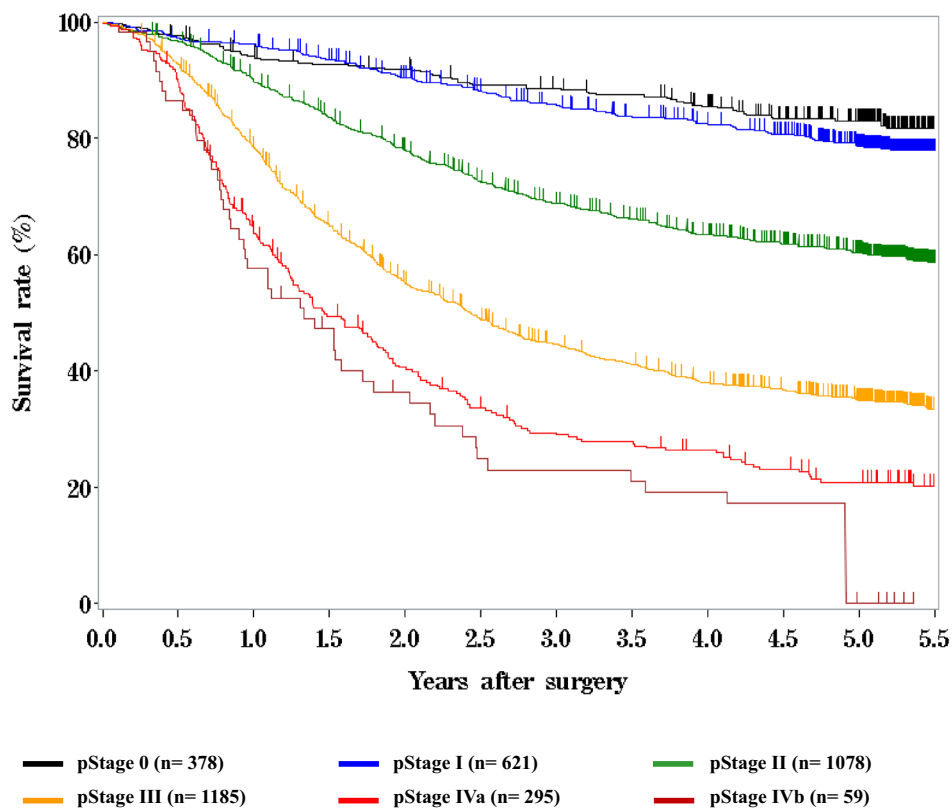
	Years after surgery				
	1	2	3	4	5
pN0	91.9%	84.1%	78.1%	74.5%	71.1%
pN1	84.2%	67.3%	60.3%	54.1%	52.3%
pN2	80.0%	58.1%	47.7%	41.4%	38.1%
pN3	73.6%	55.1%	43.4%	35.8%	31.8%
pN4	71.6%	48.2%	32.2%	28.8%	23.2%

Fig. 12 Survival of patients who underwent esophagectomy according to lymph node metastasis, pN (UICC 7th)



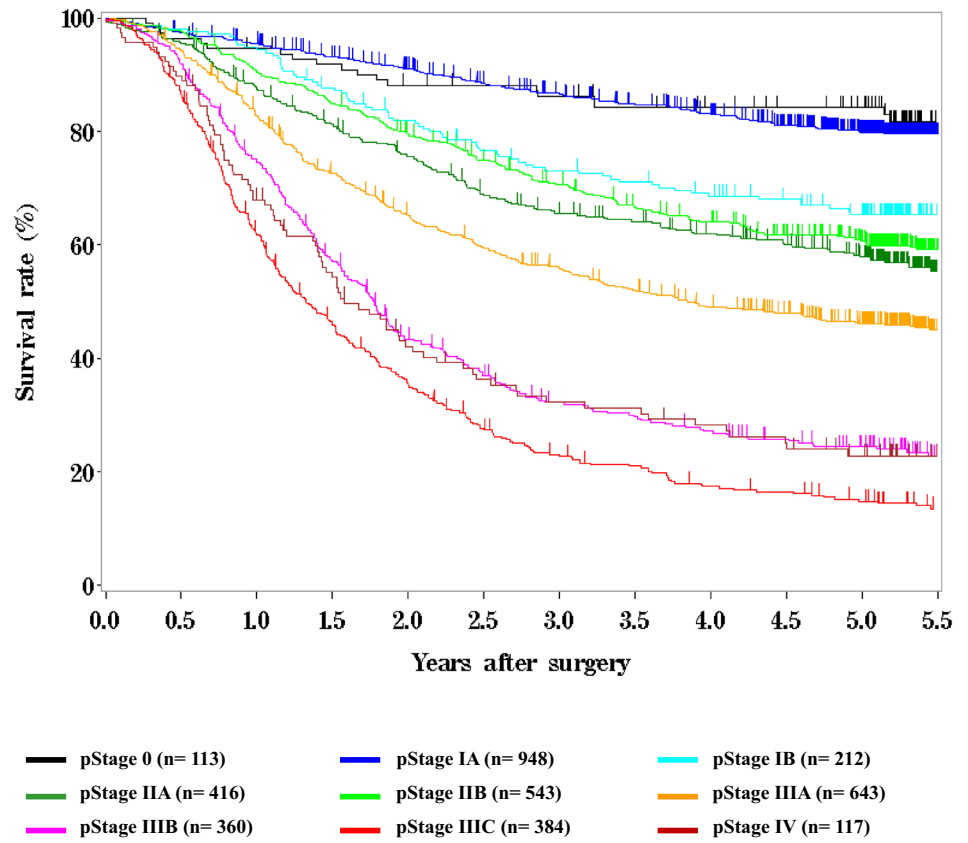
	Years after surgery				
	1	2	3	4	5
pN0	92.0%	84.3%	78.1%	74.3%	71.0%
pN1	84.6%	70.0%	61.3%	55.4%	52.2%
pN2	76.9%	51.0%	40.6%	34.5%	31.6%
pN3	66.1%	36.4%	21.4%	15.1%	12.3%

Fig. 13 Survival of patients who underwent esophagectomy according to pathological stage (JES 10th)



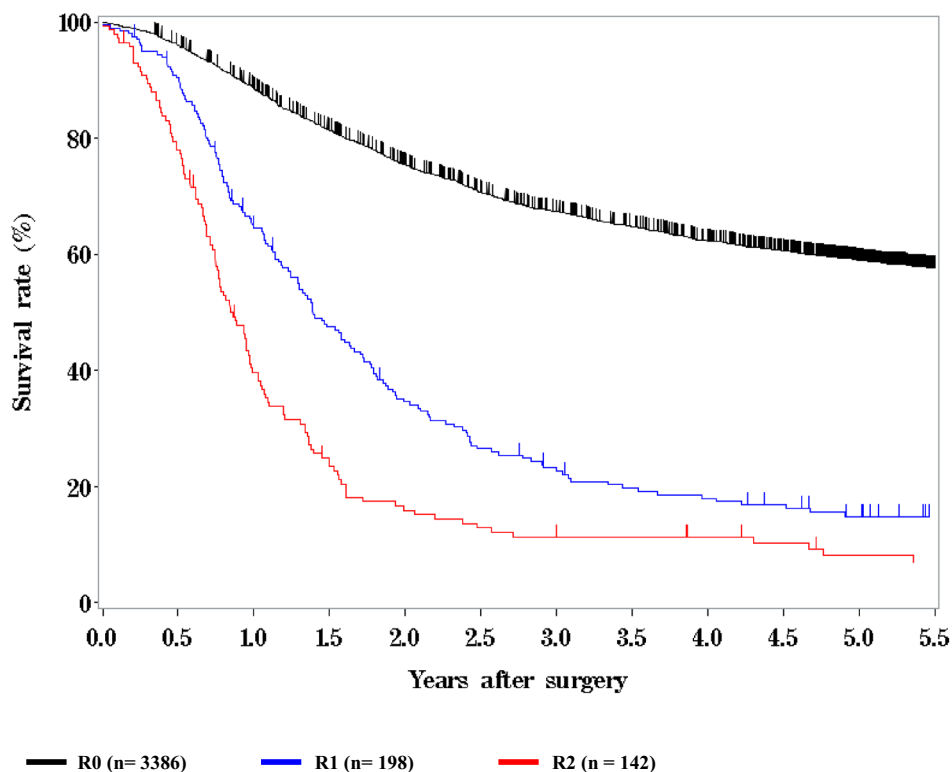
	Years after surgery				
	1	2	3	4	5
pStage 0	94.1%	91.9%	88.6%	85.4%	83.0%
pStage I	96.1%	90.4%	85.8%	82.4%	78.7%
pStage II	89.9%	78.0%	68.8%	63.4%	60.4%
pStage III	78.3%	55.1%	44.5%	37.9%	34.9%
pStage IVa	63.8%	40.6%	29.0%	26.3%	20.9%
pStage IVb	57.6%	36.4%	23.0%	19.1%	0.0%

Fig. 14 Survival of patients who underwent esophagectomy according to pathological stage (UICC TNM 7th)



	Years after surgery				
	1	2	3	4	5
pStage 0	94.6%	88.1%	86.2%	84.2%	84.2%
pStage IA	95.5%	91.1%	86.7%	83.0%	79.9%
pStage IB	94.3%	82.0%	73.1%	68.6%	65.3%
pStage IIA	87.4%	75.7%	65.5%	62.0%	57.9%
pStage IIB	90.5%	79.6%	70.7%	64.0%	60.6%
pStage IIIA	82.7%	65.1%	55.8%	49.1%	46.2%
pStage IIIB	74.6%	43.4%	32.3%	27.2%	24.4%
pStage IIIC	61.8%	35.5%	22.8%	17.4%	14.8%
pStage IV	68.0%	42.1%	32.3%	28.2%	22.8%

Fig. 15 Survival of patients who underwent esophagectomy according to residual tumor (R)



	Years after surgery				
	1	2	3	4	5
R0	88.5%	75.4%	67.3%	62.3%	58.9%
R1	64.5%	34.6%	22.6%	18.0%	14.9%
R2	39.7%	15.9%	11.4%	11.4%	8.1%

Compliance with ethical standards

Ethical Statement All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1964 and later versions.

Informed consent Informed consent or substitute for it was obtained from all patients for being included in the study.

Conflict of interest All authors have nothing to disclose with regard to commercial support.

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