Table 5 Assisted circulation (total 1,655) in 2008

	Sites	VAD								
		Device			Results					
					Not weaned			Weaned		
		Centrifugal	VAS	Others	Ongoing	Dead	Transplant	Survived	Dead	Transplant
Postcardiotomy	Left	16	11	0	2	14 (51.9)	0	8	3 (11.1)	0
	Right	3	0	0	0	1 (33.3)	0	2	0	0
	Biventricular									
	Right	1	4	0	0	1 (20.0)	0	2	2 (40.0)	0
	Left	1	4	0						
Congestive heart failure	Left	10	36	17	36	18 (28.6)	2	4	2 (3.2)	1
	Right	1	0	0	0	1 (100.0)	0	0	0	0
	Biventricular									
	Right	8	10	0	2	12 (66.7)	0	2	1 (5.6)	1
	Left	2	16	0						
Respiratory failure										
Total		42	81	17	40	47 (33.6)	2	18	8 (5.7)	2

	Sites	Heart-lung assist						Unspecified
		Method		Results				
				Not weaned		Weaned		
		PCPS	Others	Dead	Transplant	Dead	Survived	
Postcardiotomy	Left							
	Right							
	Biventricular	439	53	257 (52.2)	0	88 (17.9)	146	1
	Right							
	Left							
Congestive heart failure	Left							
	Right							
	Biventricular	878	43	479 (52.0)	1	137 (14.9)	303	1
	Right							
	Left							
Respiratory failure		81	21	32 (31.4)	1	16 (15.7)	53	0
Total		1,398	117	768 (50.7)	2	241 (15.9)	502	2

( ), % mortality; VAD, ventricular assist device; VAS, verntricular assist system; PCPS, Percutaneous Cardiopulmonary Support

Table 6 Heart transplantation (total 3) in 2008

	Cases	30-Day mortality	Hospital mortality
Heart Transplantation	11	0	0
Heart and lung transplantation	0	0	0
Total	11	0	0

( ), % mortality

Table 7 Pacemaker + ICD (total 17,358) in 2008

	Pacemaker			ICD	
	Univentricular	Biventricular	CRTD	CRTD	ICD
Initial	2,281	6,994	200	689	1,171
Exchange	1,881	3,636	51	72	383
Total	4,162	10,630	251	761	1,554

ICD, implantable cardioverter-defibrillator; CRTD, cardiac resynchronization therapy device with incorporated ICD device

(B) General thoracic surgery

We are pleased to report that after a slight dip in 2007, the number of reported cases of general thoracic surgery is now back on its steady trend of increase. The total number of general thoracic surgery cases performed in 2007 was 61,315 including 27,881 primary lung cancers, 4,142 mediastinal tumors, and 12,776 pneumothoraces. Last year's decline in reported cases was due to the newly implemented complex questionnaire.

Primary lung cancer still accounts for the largest and most formidable population of patients that we deal with. Among the 27,881 cases of lung cancer, the proportion of adenocarcinoma increased only slightly, to 67.7%, compared with 67.5% in 2007 and 2006. It appears that the increase in adenocarcinoma has now plateaued. The male:female ratio was 1.7. The number of adenocarcinomas was more than three times that of squamous cell carcinomas (21.4%), which is also reflected by the predominance of peripherally located tumors (84.7%). Because this survey is of cases that were operated on, small cell lung cancer accounts for only 1.6%. We asked for reports of the clinical and pathological stage according to the new 7th edition of lung cancer staging. Clinical stage Ia cancers comprised 52.4% of the cases operated on (a slight increase from 48.9% in 2007) followed by 20.2% of stage Ib (20.3% in 2007); stage I cancers comprised 72.6% of the total. These data indicate that more small cancers are found and operated on. Pathological stage I disease accounted for 66.1% of the total, indicating underestimation of the clinical staging.

The 30-day mortality of lung cancer patients was as low as 0.4%. This is a figure that we should be proud of and is the result of the continued efforts of surgeons, nurses, and the thoracic surgery ward team. Even pneumonectomy (608 cases) boasts the very low 30-day mortality of 2.8%. On the other hand, a small fraction of patients who underwent wedge (0.3% of 3,489) or segmental (0.3% of 2,368) resection died, which underlies the importance of patient selection and control of postoperative complications.

Thanks to the detailed questionnaire that has been implemented since 2007, we now have a clear view of the causes of postoperative death, which evade the efforts of thoracic surgery teams in postoperative patient care. Among the 237 deaths reported after pulmonary resection for lung cancer, exacerbation of interstitial pneumonia caused 63 deaths, followed by pneumonia, which caused 40 deaths. How we are going to prevent and cope with the unexpected worsening of preexisting interstitial pneumonia will be discussed in the forthcoming meetings of thoracic surgeons. We lost 29 lung cancer patients from bronchopleural fistula, a figure that represents mainly the technical failure of the operation; these may be preventable and they continue to be one of our biggest tasks in thoracic surgery. The same number (29) of patients died from respiratory failure after lung cancer surgery; these may indicate inadequate assessment of pulmonary function or patient selection.

The majority of the lung cancer patients operated on were asymptomatic; 45.9% and 31.5% of the patients were diagnosed after a medical checkup and during follow-up for other diseases, respectively, and only 15.3% were diagnosed with symptoms. Chest XP still detects 73.8% of patients, far outperforming CT. The role of screening remains controversial, and we are faced with the difficult decision of whether to operate on very slow-growing and potentially harmless lung cancers.

In 2008, 51.9% of the operations for lung cancer were performed using video-assisted thoracic surgery (VATS). In reality, this includes a wide variety of procedures, from "pure VATS" to those using VATS as a source of light. As less invasive surgery will remain the mainstream of thoracic surgery, VATS will be used in more patients each year. However, we have to define VATS more clearly and make VATS operations safer and comparable to open thoracotomy as a means of cancer treatment. Associations of thoracic surgeons must continue in their efforts to establish a VATS training system for young thoracic surgeons.

A total of 5,546 operations for metastatic pulmonary tumor were performed in 2008; 68.4% of these were performed using VATS. About half of these cases (48.5%) were metastases of colorectal cancer. Malignant pleural mesothelioma poses a great challenge to thoracic surgeons: 17 of the 294 patients operated on with malignant pleural mesotheliomas died in the hospital. To improve the outcome of surgical treatment of this disease, we need to select patients carefully, combine other modalities, and improve our technique for the relatively rare procedure of extrapleural pneumonectomy.

Of 4,142 mediastinal tumors operated on in 2008, thymoma was the most frequent (41.3%), followed by congenital cyst (16.1%), neurogenic tumor (11.6%), lymphoma (6.4%), and germ cell tumor (5.6%). Thymectomy for myasthenia gravis was performed in 577 patients; 272 of those cases were associated with thymoma. An increasing number of thymectomies are now performed using VATS and mediastinoscopy, which together comprised 23% of the thymectomies for myasthenia gravis.

A total of 12,776 patients underwent surgery for pneumothorax; 90.6% of that surgery was performed under VATS. The record shows 19 deaths among these

patients. The cause of death is unclear, but many deaths were in patients with secondary pneumothorax.

Only 25 lung transplantations were performed in 2008 with two in-hospital fatalities. We hope that the revision of the regulations on transplantation may help increase the availability of brain-dead donors in 2010.

The statistics presented here clearly show that our efforts have paid off in the form of excellent results in lung cancer surgery. However, readers are encouraged to carefully examine the figures themselves, as these may indicate the field toward which we need to direct our future efforts.

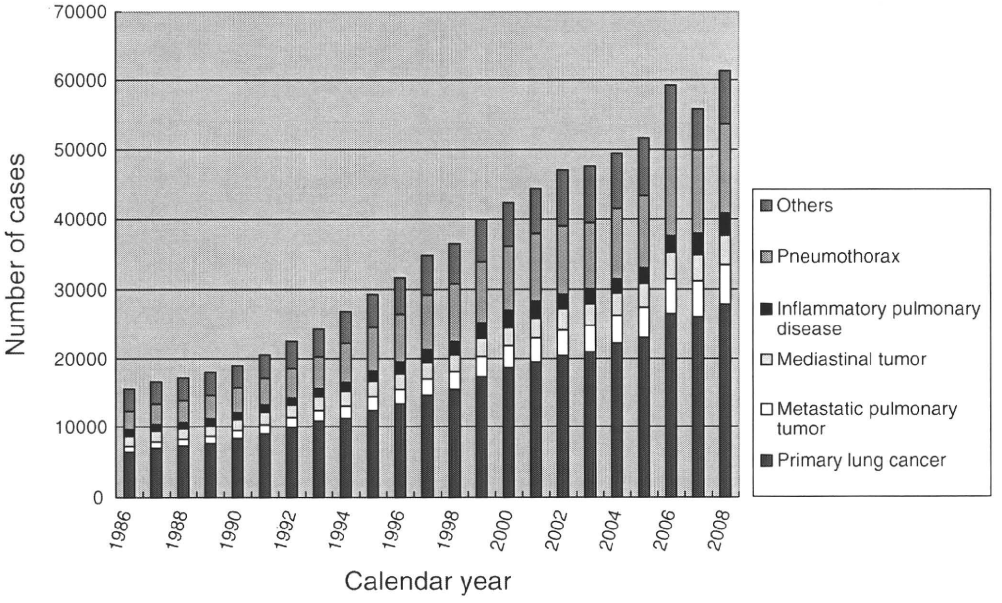

Fig. 1 General thoracic surgery

Table 1 Total entry cases of General Thoracic Surgery during 2008 in 2008

	Cases	%
Benign pulmonary tumor	700	1.1
Primary lung cancer	27,881	45.5
Other primary malignant pulmonary tumor	1,381	2.3
Metastatic pulmonary tumor	5,546	9.0
Tracheal tumor	127	0.2
Mesothelioma	469	0.8
Chest wall tumor	656	1.1
Mediastinal tumor	4,142	6.8
Thymectomy for MG without thymoma	577	0.9
Inflammatory pulmonary disease	3,274	5.3
Empyema	1,544	2.5
Bullous disease excluding pneumothorax	727	1.2
Pneumothorax	12,776	20.8
Chest wall deformity	352	0.6
Diapharagmatic hernia including traumatic	141	0.2
Chest trauma excluding diaphragmatic hernia	374	0.6
Lung transplantation	25	0.0
Others	623	1.0
Total	61,315	100.0

Table 2

in 2008

	Cases	30-Day mortality	Hospital mortality	By VATS
1. Benign pulmonary tumor	700	0 (0.0)	0 (0.0)	542
Hamartoma	400	0 (0.0)	0 (0.0)	314
Sclerosing hemangioma	103	0 (0.0)	0 (0.0)	82
Others	197	0 (0.0)	0 (0.0)	146

( ), % mortality

Table 3

in 2008

	Cases	30-Day mortality	Hospital mortality	By VATS
2. Primary malignant pulmonary tumor	28,194	118 (0.4)	250 (0.9)	
Lung cancer	27,881	117 (0.4)	248 (0.9)	14,460
Adenocarcinoma	18,864	59 (0.3)	104 (0.6)	
Squamous cell carcinoma	5,941	43 (0.7)	112 (1.9)	
Large-cell carcinoma	908	4 (0.4)	4 (0.4)	
(LCNEC)	(294)	0 (0.0)	0 (0.0)	
Small-cell carcinoma	440	4 (0.9)	4 (0.9)	
Adenosquamous carcinoma	509	4 (0.8)	6 (1.2)	
Carcinoma with plemorphic, sarcomatoid or sarcomatous elements	313	1 (0.3)	7 (2.2)	
Carcinoid	177	0 (0.0)	0 (0.0)	
Carcinomas of salivary gland type	30	0 (0.0)	0 (0.0)	
Unclassified	67	1 (1.5)	1 (1.5)	
Multiple lung cancer	413	0 (0.0)	2 (0.5)	
Others	136	1 (0.7)	2 (1.5)	
Unknown	83			
Wedge resection	3,489	9 (0.3)	20 (0.6)	2,660
Segmental excision	2,368	6 (0.3)	10 (0.4)	1,321
Sleeve segmental excision	15	0 (0.0)	0 (0.0)	2
Lobectomy	20,647	75 (0.4)	169 (0.8)	10,327
Sleeve lobectomy	446	7 (1.6)	12 (2.7)	25
Pneumonectomy	608	17 (2.8)	31 (5.1)	34
Sleeve pneumonectomy	16	2 (12.5)	4 (25.0)	0
Pleuropneumonectomy	12	0 (0.0)	1 (8.3)	0
Others	276	1 (0.4)	1 (0.4)	91
Unclassified	4			
Sarcoma	46	1 (2.2)	2 (4.3)	
AAH	149	(0.0)	(0.0)	
Others	118	(0.0)	(0.0)	66

( ), % mortality

Table 4 Details of lung cancer operation in 2008

c-Stage	Cases
I a	14,605
I b	5,635
II a	1,789
II b	1,619
III a	2,114
III b	478
IV	350
NA	1,291
Total	27,881

NA, not available

p-Stage	Cases
0 (pCR)	62
I a	13,451
I b	4,985
II a	2,143
II b	1,798
III a	3,203
III b	768
IV	667
NA	866
Total	27,881

Age (years)	Cases
<20	8
20–29	36
30–39	209
40–49	892
50–59	4,113
60–69	9,096
70–79	10,922
80–89	2,538
≥90	27
NA	40
Total	27,881

Sex	Cases
Male	17,556
Female	10,285
NA	40
Total	27,881

Associated disease	Cases
Smoking history	15,109
BMI ≥ 30	666
Brain and cerebrovascular disease	1,178
$FEV_{1.0\%} < 40\%$	736
Ischemic heart disease	1,124
Interstitial pneumonia	1,036
Cr ≥ 2	295
Liver cirrhosis	99
Hb A1c ≥ 8	1,022
Hb ≤ 8	93
Autoimmune disease	313

Postoperative mobidity	Cases
Wound infection	302
Bleeding >500 ml/h	102
Air leak >2 weeks	433
Chylothorax	215
Bronchopleural fistula	119
Pulmonary embolism	44
Pyothorax	177
Pneumonia	521
Respiration support >3 days	146
Interstitial pneumonia exacerbation	157
Cardiac infarction	27
Arrhythmia	998
Brain infarction, bleeding	62
Others	440

Cause of death	Cases
Cardiovascular	26
Pneumonia	40
Pyothorax	6
Bronchopleural fistula	29
Respiratory failure	29
Pulmonary embolism	10
Interstitial pneumonia	63
Brain infarction or bleeding	6
Lung cancer	16
Others	18
Unknown	4
Unclassifiable	1
Total	248

Diagnosis	Cases
Symptom	4,259
Medical checkup	12,804
Chest xp	9,443
CT	2,728
Sputum cytology	83
Others	182
Followup of other disease	8,786
Others	461

Location	Cases
Peripheral	23,626
Central	2,296
Multiple	234
Unclassified	414
Others	70

Table 5 in 2008

	Cases	30-Day mortality	Hospital mortality	By VATS
3. Metastatic pulmonary tumor	5,546	5 (0.1)	17 (0.3)	3,791
Colorectal	2,688	3 (0.1)	7 (0.3)	1,874
Hepatobiliary/pancreatic	206	0 (0.0)	2 (1.0)	149
Uterine	244	0 (0.0)	0 (0.0)	178
Mammary	335	0 (0.0)	0 (0.0)	236
Ovarian	54	0 (0.0)	0 (0.0)	37
Testicular	49	0 (0.0)	0 (0.0)	36
Renal	452	0 (0.0)	0 (0.0)	327
Skeletal	116	0 (0.0)	0 (0.0)	72
Soft tissue	243	0 (0.0)	1 (0.4)	152
Otorhinolaryngological	308	0 (0.0)	1 (0.3)	236
Pulmonary	340	1 (0.3)	3 (0.9)	156
Others	494	1 (0.2)	3 (0.6)	338
Unknown	17	0	0	

( ), % mortality

Table 6 in 2008

	Cases	30-Day mortality	Hospital mortality
4. Tracheal tumor	127	0 (0.0)	0 (0.0)
Primary malignant	84	0 (0.0)	0 (0.0)
Metastatic	25	0 (0.0)	0 (0.0)
Benign	18	0 (0.0)	0 (0.0)

( ), % mortality

Table 7 in 2008

	Cases	30-Day mortality	Hospital mortality	By VATS	Operation		
5. Tumor of pleural origin	469	7 (1.5)	18 (3.8)		Extrapleural pneumonectomy	Pan-pleurectomy	Others
Solitary fibrous tumor	142	0 (0.0)	0 (0.0)				
Malignant pleural mesothelioma	294	7 (2.4)	17 (5.8)		127	17	146
Others	33	0 (0.0)	1 (3.0)		0	0	33

( ), % mortality

Table 8 in 2008

	Cases	30-Day mortality	Hospital mortality
6. Chest wall tumor	656	0 (0.0)	2 (0.3)

( ), % mortality

Table 9 in 2008

	Cases	30-Day mortality	Hospital mortality	By VATS
7. Mediastinal tumor	4,142	5 (0.1)	13 (0.3)	1,836
Thymoma*	1,712	2 (0.1)	5 (0.3)	381
Thymic cancer	240	0 (0.0)	2 (0.8)	24
Germ cell tumor	234	0 (0.0)	0 (0.0)	63
Benign	166	0 (0.0)	0 (0.0)	53
Malignant	67	0 (0.0)	0 (0.0)	9
unclassified	1	0	0	1
Neurogenic tumor	479	0 (0.0)	1 (0.2)	321
Congenital cyst	669	0 (0.0)	0 (0.0)	428
Goiter	128	0 (0.0)	0 (0.0)	18
Lymphatic tumor	266	1 (0.4)	1 (0.4)	148
Others	403	2 (0.5)	4 (1.0)	453
Unknown	11			

( ), % mortality
* Includes those with myasthenia gravis

Table 10 in 2008

	Cases	30-Day mortality	Hospital mortality	By VATS
8. Thymectomy for myasthenia gravis	577	2 (0.3)	4 (0.7)	133
With thymoma	272	0 (0.0)	2 (0.7)	

( ), % mortality

Table 11 in 2008

	Cases	30-Day mortality	Hospital mortality
9. Operation for nonneoplastic disease	19,882	95 (0.5)	172 (0.9)

in 2008

	Cases	30-Day mortality	Hospital mortality	By VATS
A. Inflammatory pulmonary disease	3,274	10 (0.3)	15 (0.5)	2,196
Tuberculous infection	145	1 (0.7)	0 (0.0)	86
Mycobacterial infection	292	1 (0.3)	2 (0.7)	174
Fungal infection	397	3 (0.8)	6 (1.5)	184
Bronchiectasis	96	2 (2.1)	2 (2.1)	38
Tubeculous nodule	386	0 (0.0)	0 (0.0)	284
Infection	1,262	2 (0.2)	4 (0.3)	916
Interpulmonary lymph noce	190	0 (0.0)	0 (0.0)	176
Others	506	1 (0.2)	1 (0.2)	338

( ), % mortality

Table 12 in 2008

	Cases	30-Day mortality	Hospital mortality	Radical surgery
B. Empyema	1,544	17 (1.1)	58 (3.8)	1,107

( ), % mortality

Table 13 in 2008

	Cases	30-Day mortality	Hospital mortality	By VATS
C. Descending necrotizing mediasinitis	72	1 (1.4)	2 (2.8)	35

( ), % mortality

Table 14 in 2008

	Cases	30-Day mortality	Hospital mortality	By VATS
D. Bullous disease	727	1 (0.1)	3 (0.4)	463
Emphysematous bulla	554	1 (0.2)	2 (0.4)	358
Bronchogenic cyst	103	0 (0.0)	0 (0.0)	65
Emphysema with volume reduction surgery	30	0 (0.0)	1 (3.3)	23
Others	39	0 (0.0)	0 (0.0)	17
Unknown	1			

( ), % mortality

Table 15 in 2008

	Cases	30-Day mortality	Hospital mortality	By VATS
E. Pneumothorax	12,776	19 (0.1)	44 (0.3)	11,573
Primary spontaneous	11,584	5 (0.0)	7 (0.1)	10,681
Secondary	1,183	14 (1.2)	37 (3.1)	892
Unknown	9	0	0	

( ), % mortality

Table 16 in 2008

	Cases	30-Day mortality	Hospital mortality
F. Chest wall deformity	352	1 (0.3)	1 (0.3)
Funnel chest	329	0 (0.0)	0 (0.0)
Others	23	1 (4.3)	1 (4.3)

( ), % mortality

Table 17 in 2008

	Cases	30-Day mortality	Hospital mortality	Traumatic
G. Diaphragmatic hernia	141	2 (1.4)	2 (1.4)	37

( ), % mortality

Table 18 in 2008

	Cases	30-Day mortality	Hospital mortality
H. Chest trauma	374	39 (10.4)	40 (10.7)

( ), % mortality

Table 19 in 2008

	Cases	30-Day mortality	Hospital mortality	Sympatectomy
I. Other respiratory surgery	623	5 (0.8)	7 (1.1)	22
Arteriovenous malformation*	102	1 (1.0)	1 (1.0)	9
Pulmonary sequestration	122	1 (0.8)	1 (0.8)	2
Others	399	3 (0.8)	5 (1.3)	11

( ), % mortality
* Includes those with myasthenia gravis

Table 20 in 2008

	Cases	30-Day mortality	Hospital mortality
10. Lung transplantation	25	0 (0.0)	2 (8.0)
Single lung	9	0 (0.0)	0 (0.0)
Bilateral	5	0 (0.0)	1 (20.0)
Living donor	11	0 (0.0)	1 (9.1)
Donor	25		

( ), % mortality

Table 21 in 2008

	Cases	30-Day mortality	Hospital mortality
11. Video-assisted thoracic surgery	37,733	52 (0.1)	85 (0.2)

( ), % mortality
Including thoracic sympathectomy (244)

Table 22 in 2008

	Cases	30-Day mortality	Hospital mortality
12. Tracheobronchoplasty	576	11 (1.9)	15 (2.6)
Trachea	48	2 (4.2)	2 (4.2)
Carinal reconstruction	14	1 (7.1)	2 (14.3)
Sleeve pneumonectomy	73	1 (1.4)	2 (2.7)
Bronchus	391	7 (1.8)	9 (2.3)
Others	50	0 (0.0)	0 (0.0)

( ), % mortality

Table 23 in 2008

	Cases	30-Day mortality	Hospital mortality
13. Pediatric surgery	519	3 (0.6)	3 (0.6)

( ), % mortality

Table 24 in 2008

	Cases	30-Day mortality	%	Hospital mortality	%
14. Combined resection of neighboring organ(s)	1,478	8	0.54	19	1.29

Organ resected	Primary lung cancer			Mediasinal tumor		
	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality
Aorta	11	1 (9.1)	1 (9.1)	1	0 (0.0)	0 (0.0)
Superior vena cava	25	1 (4.0)	1 (4.0)	34	0 (0.0)	1 (2.9)
Brachiocephalic vein	11	0 (0.0)	0 (0.0)	73	0 (0.0)	2 (2.7)
Pericardium	190	1 (0.5)	5 (2.6)	175	0 (0.0)	1 (0.6)
Pulmonary artery	175	0 (0.0)	0 (0.0)	4	0 (0.0)	0 (0.0)
Left atrium	38	2 (5.3)	2 (5.3)	2	0 (0.0)	0 (0.0)
Diaphragm	141	0 (0.0)	0 (0.0)	13	0 (0.0)	0 (0.0)
Chest wall (including ribs)	512	2 (0.4)	6 (1.2)	15	0 (0.0)	0 (0.0)
Vertebra	22	1 (4.5)	1 (4.5)	5	0 (0.0)	0 (0.0)
Esophagus	5	0 (0.0)	0 (0.0)	3	0 (0.0)	0 (0.0)
Lung				157	0 (0.0)	2 (1.3)

( ), % mortality

Table 25 in 2008

	Cases	30-Day mortality	Hospital mortality
15. Operation of lung cancer invading the chest wall of the apex	141	0 (0.0)	1 (0.7)

( ), % mortality
Includes tumors invading the anterior apical chest wall and posterior apical chest wall (superior sulcus tumor, so-called Pancoast type)

(C) Esophageal surgery

During 2008 alone, a total of 12,488 patients with esophageal diseases were registered from 501 institutions (response rate 95.1%) that are affiliated with The Japanese Association for Thoracic Surgery and/or the Japan Esophageal Society. Among these institutions, 104 (20.8%) had 20 or more patients who underwent esophageal surgery during the year 2008, which shows the same tendency of esophageal operations in higher volume institutions when compared with the data of 2007 (20.9%) [1] (Table 1). Of 2,515 patients with a benign esophageal disease, 872 (34.7%) patients underwent surgery, and 29 (1.2%) patients underwent endoscopic resection, while 1,614 (64.2%) patients did not undergo any surgical treatment (Table 2). Of 9,973 patients with a malignant esophageal tumor, 6,831 (68.5%) patients underwent resection—esophagectomy in 5,124 (51.4%) and endoscopic mucosal resection (EMR) including endoscopic submucosal dissection (ESD) in 1,705 (17.1%), while 3,144 (31.5%) patients did not undergo any resection (Tables 3, 4). The decrease in registered patients with surgically treated benign esophageal diseases is obvious, and this decrease in registered benign esophageal diseases with operation for these few years may show that a larger number of such patients are treated in medical departments. Moreover, the number of registered patients with esophageal disease, particularly those undergoing nonsurgical therapy for a malignant esophageal disease, has been increasing since 1990 (Fig. 1).

Among benign esophageal diseases (Table 2), esophageal varices, hiatal hernia, and esophagitis (including reflux esophagitis) were the most common conditions in Japan. On the other hand, achalasia, benign esophageal tumors, spontaneous rupture of the esophagus, and congenital esophageal atresia were common diseases that were treated surgically, as were the above-mentioned diseases. Thoracoscopic and/or laparoscopic procedures have been widely adopted for benign esophageal diseases, in particular achalasia, hiatal hernia, and benign tumors. Open surgery was performed in 504 patients who had a benign esophageal disease, with 30-day mortality in 8 (1.6%) patients and with hospital mortality, including 30-day mortality, in 14 (2.8%), while thoracoscopic and/or laparoscopic surgery was performed in 368 patients, with no patient deaths registered in the 30-day mortality category and 1 (0.3%) death in the hospital mortality category. The difference in these death rates between open and scopic surgery seems to be related to the conditions requiring open surgery. Most of the deaths occurred in patients with spontaneous esophageal rupture, which required open surgery.

The majority of malignant diseases were carcinomas (Table 3). Among esophageal carcinomas, the incidence of squamous cell carcinoma was 92.5%, and that of adenocarcinomas including Barrett's cancer was 4.0%. The resection rate for patients with a squamous cell carcinoma was 66.9%, and for patients with an adenocarcinoma it was 88.1%.

Regarding location, the thoracic esophagus was the most common site of the cancer (Table 4). Of the 3,456 patients (34.6% of total esophageal malignancies) with superficial esophageal cancers in the mucosal and submucosal layers, 1,398 (40.5%) underwent esophagectomy, and 1,705 (49.3%) underwent EMR. The 30-day mortality and hospital mortality rates after esophagectomy for patients with a superficial cancer were 0.6% and 1.5%, respectively. There were no EMR-related deaths. Advanced esophageal cancer invading deeper than the submucosal layer was observed in 6,403 (64.2%) patients. Of the 6,403 patients with advanced esophageal cancer, 3,723 (58.1%) underwent esophagectomy, with a 1.5% 30-day mortality rate and a 3.2% hospital mortality rate.

Multiple primary cancers were observed in 1,088 (10.9%) of all the 9,973 patients with esophageal cancer. Synchronous cancer was found in 611 (6.1%) patients, and metachronous cancer (found before esophageal cancer) was observed in 477 (4.8%). The stomach is the most common site for synchronous and other malignancies, followed by head and neck cancer, and both stomach and head and neck cancers are common sites in the metachronous occurrence of other malignancies (Table 4).

Among esophagectomy procedures, transthoracic esophagectomy through a right thoracotomy was most commonly adopted for patients with a superficial cancer as well as for those with an advanced cancer (Table 5). Whereas transhiatal esophagectomy is commonly performed in Western countries, in Japan it was adopted in only 4.9% of patients having a superficial cancer who underwent esophagectomy and in 1.9% of those having an advanced cancer. Thoracoscopic and/or laparoscopic esophagectomy was adopted for 416 patients (29.8%) with a superficial cancer and for 593 patients (15.9%) with an advanced cancer. The number of cases of thoracoscopic and/or laparoscopic surgery for superficial or advanced cancer has been increasing for several years (Fig. 2).

Combined resection of the neighboring organs during resection of an esophageal cancer was performed in 247 patients (Tables 5, 6). Resection of the aorta with concomitant esophagectomy was not performed in 2008. Tracheal and/or bronchial resection combined with esophagectomy was performed in 17 patients, with a 30-day mortality rate of 5.9% and a hospital mortality

rate of 11.8%. Lung resection combined with esophagectomy was performed in 48 patients, with a 30-day mortality rate of 2.1% and a hospital mortality rate of 6.3%.

Salvage surgery after definitive (chemo) radiotherapy was performed in 203 patients, with a 30-day mortality rate of 0.5% and a hospital mortality rate of 3.9% (Table 5).

Lastly, despite the efforts of the Committee to cover wider patient populations for this annual survey, most of the institutions that responded to the questionnaire were the departments of thoracic or esophageal surgery. It should be noted that a larger number of patients with esophageal diseases may have been treated medically and endoscopically. We should continue our efforts for a complete survey through more active collaboration with the Japan Esophageal Society and other related societies.

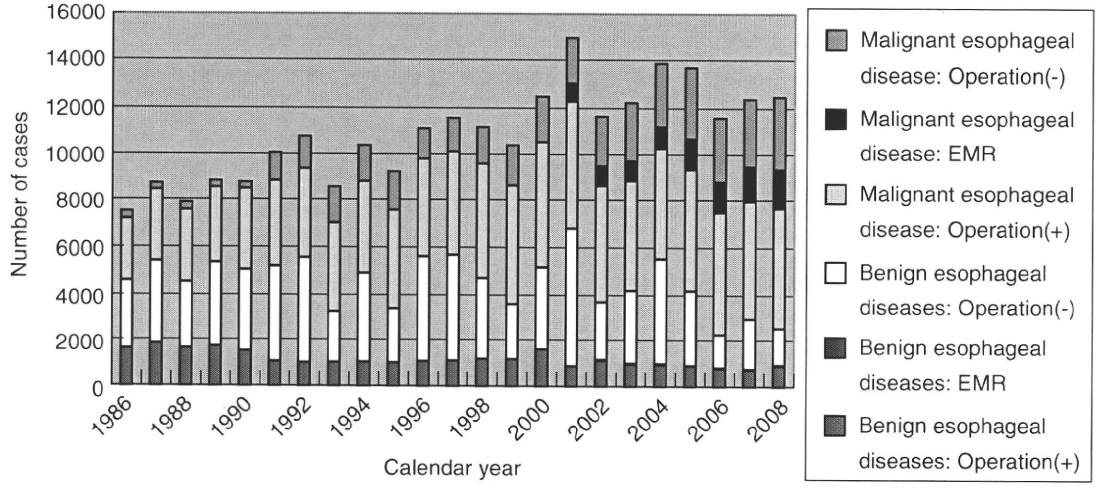

Fig. 1 Annual trend of in-patients with esophageal diseases. *EMR*, endoscopic mucosal resection (including endoscopic submucosal dissection)

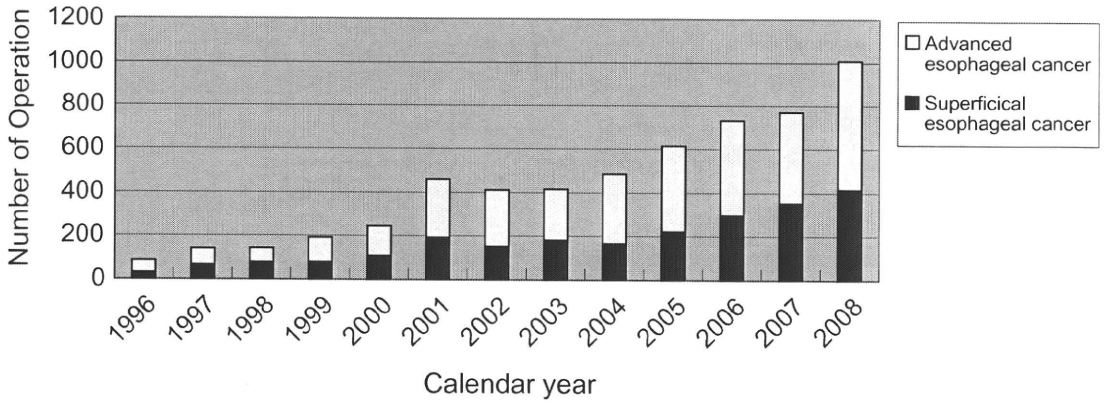

Fig. 2 Annual trend of video-assisted esophagectomy for esophageal malignancy

Table 1 Distribution of the number of esophageal operations in 2008 at the institutions in 2008

Esophageal surgery			
No. of operations in 2007	Benign esophageal disease	Malignant esophageal disease	Benign + malignant disease
1–4	196	195	184
5–9	34	108	121
10–19	15	86	92
20–29	1	28	36
30–39	1	22	25
40–49	0	10	11
≥50	2	27	32
Total	249	476	501

Table 2 Benign esophageal diseases in 2008

	Operation(+)									Endoscopic resection	Operation (−)	Total
	No. of patients			30-Day mortality			Hospital mortality					
	Total	Open	T/L	Total	Open surgery	T/L	Total	Open surgery	T/L			
1. Achalasia	164	28	136	0	0 (0.0)	0	3	3 (10.7)	0		52	216
2. Benign tumor	60	32	28	0	0 (0.0)	0	0	0 (0.0)	0	29	74	163
(1) Leiomyoma	38	18	20	0	0 (0.0)	0	0	0 (0.0)	0	15	64	117
(2) Cyst	4	3	1	0	0 (0.0)	0	0	0 (0.0)	0	1	4	9
(3) Others	18	11	7	0	0 (0.0)	0	0	0 (0.0)	0	13	5	36
(4) Not specified			0	0	0	0	0	0	0	0	1	1
3. Diverticulum	20	12	8	0	0 (0.0)	0	0	0 (0.0)	0		24	44
4. Hiatal hernia	233	85	148	0	0 (0.0)	0	0	0 (0.0)	0		150	383
5. Spontaneous rupture of the esophagus	71	69	2	3	3 (4.3)	0	5	5 (7.2)	0		12	83
6. Esophagotracheal fistula	12	12	0	0	0 (0.0)	0	1	1 (8.3)	0		11	23
7. Congenital esophageal atresia	56	54	2	0	0 (0.0)	0	0	0 (0.0)	0		16	72
8. Congenital esophageal stenosis	5	4	1	0	0 (0.0)	0	0	0 (0.0)	0		4	9
9. Corrosive stricture of the esophagus	5	3	2	0	0 (0.0)	0	0	0 (0.0)	0		8	13
10. Esophagitis, Esophageal ulcer	58	31	27	0	0 (0.0)	0	0	0 (0.0)	0		304	362
11. Esophageal varices	145	141	4	2	2 (1.4)	0	2	2 (1.4)	0		871	1,016
(1) Laparotomy	25	21	4	2	2 (9.5)		2	2 (9.5)	0			25
(2) Others				0			0					0
(3) Sclerotherapy				0			0				608	608
12. Others	43	33	10	3	3 (9.1)	0	4	3 (9.1)	1		88	131
Total	872	504	368	8	8 (1.6)	0	15	14 (2.8)	1	29	1,614	2,515

( ), % mortality; T/L, thoracoscopic and/or laparoscopic resection

Table 3 Malignant esophageal diseases (histological classification) in 2008

	Resection(+)	Resection(−)	Total
Carcinomas	6,654	3,121	9,775
1. Squamous cell carcinoma	6,053	2,989	9,042
2. Basaloid(-squamous) carcinoma	100	4	104
3. Carcinosarcoma	40	6	46
4. Adenocarcinoma in the Barrett's esophagus	229	20	249
5. Other adenocarcinoma	112	26	138
6. Adenosquamous carcinoma	23	3	26
7. Mucoepidermoid carcinoma	3	1	4
8. Adenoid cystic carcinoma	0	0	0
9. Endcrine cell carcinoma	17	18	35
10. Undifferentiated carcinoma	27	26	53
11. Others	9	28	37
12. Redundant	(1)		
13. Unknown	41	0	
Other malignancies	35	11	46
1. Malignant nonepithelial tumors	8	0	8
2. Malignant melanoma	18	8	26
3. Other malignant tumors	9	3	12
Not specified	141	11	152
Total	6,830	3,143	9,973

Resection includes endoscopic resection

Table 4 Malignant esophageal disease (clinical characteristics) in 2008

	Operation(+)			EMR	Operation(−)	Total
	Cases	30-Day mortality	Hospital mortality			
1. Esophageal cancer	5,124	63 (1.2)	144 (2.8)	1,705	3,144	9,973
A. Location						0
(1) Cervical esophagus	208	0 (0.0)	5 (2.4)	49	271	528
(2) Thoracic esophagus	4,231	57 (1.3)	130 (3.1)	1,426	2,611	8,268
(3) Abdominal esophagus	424	3 (0.7)	6 (1.4)	81	84	589
(4) Multiple cancers	249	3 (1.2)	3 (1.2)	148	120	517
(5) Others/not described	12	0	0	1	58	71
B. Tumor depth						
(1) Superficial cancer	1,398	8 (0.6)	21 (1.5)	1,705	353	3,456
(2) Advanced cancer	3,723	54 (1.5)	119 (3.2)		2,680	6,403
(3) Not specified	3	1	4		111	114
2. Multiple primary cancers	719	6 (0.8)	17 (2.4)	369		1,088
A. Synchronous	473	3 (0.6)	10 (2.1)	138		611
(1) Head and neck	147	0 (0.0)	0 (0.0)	66		213
(2) Stomach	195	2 (1.0)	7 (3.6)	48		243
(3) Others	11	1 (9.1)	2 (18.2)	11		22
(4) Triple cancers	30	0 (0.0)	1 (3.3)	9		39
(5) Not specified				4		
B. Metachronous	246	3 (1.2)	7 (2.8)	231		477
(1) Head and neck	62	1 (1.6)	2 (3.2)	82		144
(2) Stomach	69	2 (2.9)	3 (4.3)	73		142
(3) Others	103	0 (0.0)	2 (1.9)	55		158
(4) Triple cancers	12	0 (0.0)	0 (0.0)	27		39

( ), % mortality; EMR, endoscopic mucosal resection (including endoscopic submucosal dissection)

Table 5 Malignant esophageal disease (surgical procedures) in 2008

	Cases	30-Day mortality	Hospital mortality
Superficial cancer			
1. Endoscopic mucosal resection	1,705	0 (0.0)	0 (0.0)
2. Esophagectomy	1,398	8 (0.6)	21 (1.5)
(1) Transhiatal esophagectomy	68	0 (0.0)	1 (1.5)
(2) Thoracoscopic and/or laparoscopic procedure	416	1 (0.2)	4 (1.0)
(3) Transthoracic (rt.) esophagectomy and reconstruction	824	3 (0.4)	11 (1.3)
(4) Transthoracic (lt.) esophagectomy and reconstruction	25	0 (0.0)	0 (0.0)
(5) Cervical esophageal resection and reconstruction	7	0 (0.0)	0 (0.0)
(6) Two-stage operation	15	1 (6.7)	1 (6.7)
(7) Others/not specified	43	3 (7.0)	4 (9.3)
Advanced cancer			
1. Endoscopic mucosal resection	0		
2. Esophagectomy	3,723	54 (1.5)	119 (3.2)
(1) Transhiatal esophagectomy	71	2 (2.8)	5 (7.0)
(2) Thoracoscopic and/or laparoscopic procedure	593	10 (1.7)	19 (3.2)
(3) Transthoracic (rt.) esophagectomy and reconstruction	2,693	39 (1.4)	84 (3.1)
(4) Transthoracic (lt.) esophagectomy and reconstruction	143	2 (1.4)	3 (2.1)
(5) Cervical esophageal resection and reconstruction	95	0 (0.0)	1 (1.1)
(6) Two-stage operation	50	1 (2.0)	6 (12.0)
(7) Others/not specified	79	0 (0.0)	1 (1.3)
(Depth not specified)	3	1	4
Combined resection of other organs	250	2 (0.8)	6 (2.4)
1. Aorta	0	0 (0.0)	0 (0.0)
2. Trachea, bronchus	17	1 (5.9)	2 (11.8)
3. Lung	48	1 (2.1)	3 (6.3)
4. Others	185	0 (0.0)	1 (0.5)
Salvage surgery	203	1 (0.5)	8 (3.9)

Table 6 Mortality after combined resection of the neighbouring organs in 2008

	Esophagectomy			Combined resection											
				Aorta			Tracheobronchus			Lung			Others		
Year	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c
1996	4,194	120	2.86%	7	3	42.86%	24	0	0.00%	50	2	4.00%	78	4	5.13%
1997	4,441	127	2.86%	1	0	0.00%	34	5	14.71%	56	1	1.79%	94	3	3.19%
1998	4,878	136	2.79%	4	0	0.00%	29	0	0.00%	74	1	1.35%	128	2	1.56%
1999	5,015	116	2.31%	5	0	0.00%	23	2	8.70%	68	0	0.00%	122	1	0.82%
2000	5,350	81	1.51%	2	0	0.00%	23	2	8.70%	69	0	0.00%	96	1	1.04%
2001	5,521	110	1.99%	1	0	0.00%	26	1	3.85%	83	3	3.61%	99	2	2.02%
2002	4,904	66	1.35%	3	1	33.33%	20	2	10.00%	63	0	0.00%	63	1	1.59%
2003	4,639	45	0.97%	0	0	0.00%	24	2	8.33%	58	0	0.00%	88	1	1.14%
2004	4,739	64	1.35%	2	0	0.00%	17	0	0.00%	59	5	8.47%	119	2	1.68%
2005	5,163	52	1.01%	1	0	0.00%	11	1	9.09%	67	1	1.49%	73	1	1.37%
2006	5,236	63	1.20%	0	0	0.00%	17	0	0.00%	62	2	3.23%	122	3	2.46%
2007	4,990	60	1.20%	0	0	0.00%	25	1	4.00%	44	1	2.27%	138	2	1.45%
2008	5,124	63	1.23%	0	0	0.00%	17	1	5.88%	48	1	2.08%	185	0	0.00%
Total	64,194	1,103	1.76%	26	4	15.38%	290	17	5.86%	801	17	2.12%	1,405	23	1.64%

a, number of patients who underwent the operation
b, number of patients who died within 30 days after the operation
c, % ratio of b/a (i.e., direct operative mortality)

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Members of the Committee for Scientific Affairs

Ryuzo Sakata, MD, Yoshitaka Fujii, MD, Tomoyuki Goya, MD, Koichi Kaneko, MD, Hiroyuki Kuwano, MD, Arata Murakami, MD, Kiyoharu Nakano, MD, Hiroshi Nishida, MD, Yutaka Okita, MD, Soji Ozawa, MD, Yuzuru Sakakibara, MD, Kisaburou Sakamoto, MD, Yuichi Ueda, MD

Difference in Patient Profiles and Outcomes in Japanese Versus American Patients Undergoing Coronary Revascularization (Collaborative Study by CREDO-Kyoto and the Texas Heart Institute Research Database)

Shun Kohsaka, MD[a,*], Takeshi Kimura, MD, PhD[c], Masashi Goto, MD, MPH, PhD[e], Vei-Vei Lee, MS[b], MacArthur Elayda, MD, PhD[b], Yutaka Furukawa, MD, PhD[f], Masanori Fukushima, MD, PhD[g], Masashi Komeda, MD, PhD[h], Ryuuzou Sakata, MD, PhD[d], James T. Willerson, MD[a], James M. Wilson, MD[a], and Toru Kita, MD, PhD[f]

Although coronary revascularization is common in both Japan and the United States (US), no direct comparison has been performed to demonstrate differences in the clinical characteristics and long-term outcomes of patients in these 2 countries. We analyzed the preprocedural, in-hospital, and long-term data from the Coronary Revascularization Demonstrating Outcome registry (Kyoto, Japan) and the Texas Heart Institute Research Database (Houston, Texas) of 16,100 patients who had undergone elective, initial percutaneous coronary intervention or coronary artery bypass grafting. The Japanese procedures were performed from 2000 to 2002 (n = 8,871, follow-up period 3.5 years, interquartile range 2.6 to 4.3) and the US procedures from 1999 to 2003 (n = 7,229, follow-up period 5.2 years, interquartile range 3.8 to 6.5). The Japanese patients tended to be older (mean age 67.2 vs 62.7 years; p <0.001), to smoke (52.9% vs 46.0%; p <0.001), and to have diabetes (39.2% vs 31.0%; p <0.001) and stroke (16.4% vs 5.0%; p <0.001). The US patients were more obese (body mass index 23.7 vs 29.3 kg/m^2; p <0.001), with greater rates of systemic atherosclerotic disease. Both groups had a similar in-hospital mortality rate (Japanese patients 0.9% vs US patients 1.1%; p = 0.19) and crude long-term mortality rate (Japanese patients 27.7/1,000 person-years, US patients 28.2/1,000 person-years; p = 0.35). After adjustment for known predictors, the US group had greater long-term mortality than the Japanese group (hazard ratio 1.71, 95% confidence interval 1.50 to 1.95; p <0.001). This finding was consistent among all high-risk subgroups. In conclusion, the 2 registries showed similar crude outcomes but important differences in patient risk factors such as obesity. In the adjusted analysis, the Japanese patients had better outcomes than did the US patients. Additional study is needed to assess the effect of ethnic and risk factor variations on coronary artery disease. © 2010 Elsevier Inc. All rights reserved. (Am J Cardiol 2010;105:1698–1704)

Physicians in both Japan and the United States (US) perform a high volume of coronary revascularization procedures; however, the ethnicities and lifestyles of their patients differ greatly.[1,2] In Western countries, several large-scale databases of patients with coronary artery disease (CAD) have been established.[3,4] Despite the large number of subjects enrolled in these studies, the Asian subgroup has been relatively small. Furthermore, few studies have been conducted in Asian countries, mainly because patients have been hesitant to enroll in clinical trials and sufficient resources are lacking to maintain large databases. Hence, little is known about the clinical presentation and postrevascularization outcomes of Asian patients with CAD or about how these patients compare with their counterparts in the US. To help fill this void, we assessed the clinical characteristics and long-term outcomes of Japanese versus US patients by comparing information from 2 large databases concerning percutaneous coronary intervention (PCI) and coronary artery bypass grafting (CABG) in these 2 countries.

Divisions of [a]Cardiology and [b]Biostatistics, Texas Heart Institute at St. Luke's Episcopal Hospital, Houston, Texas; Departments of [c]Cardiovascular Medicine and [d]Cardiovascular Surgery, Kyoto University Graduate School of Medicine, Kyoto, Japan; [e]Kyoto University Health Service, Kyoto, Japan; [f]Division of Cardiology, Kobe City Medical Center General Hospital, Kobe City, Japan; [g]Translational Research Center, Kyoto University Hospital, Kyoto, Japan; and [h]Department of Cardiovascular Surgery, Nagoya Heart Center, Nagoya, Japan. Manuscript received October 15, 2009; manuscript received and accepted January 20, 2010.

Dr. Kohsaka is currently appointed with Keio University, School of Medicine, Tokyo, Japan.

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Drs. Kohsaka and Goto had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

*Corresponding author: Tel: (713) 529-5530; fax: (713) 791-1786.
E-mail address: sk2798@columbia.edu (S. Kohsaka).

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Table 1
Patient demographic data stratified by registry and revascularization procedure

Variable	Missing Data	Japan (n = 8,871)	United States (n = 7,229)	p Value	PCI			CABG		
					Japanese Patients (n = 6,510)	US Patients (n = 4,076)	p Value	Japanese Patients (n = 2,361)	US Patients (n = 3,153)	p Value
Age (years)	0	67.2 ± 10.0	62.7 ± 11.1	<0.001	67.2 ± 10.2	62.4 ± 11.6	<0.001	67.1 ± 9.4	63.1 ± 10.6	<0.001
Women	0	29.1%	29.9%	0.28	29.7%	32.4%	0.003	27.6%	26.7%	0.46
Body mass index (kg/m^2)	439	23.7 ± 3.2	29.3 ± 5.8	<0.001	23.7 ± 3.3	29.6 ± 6.1	<0.001	23.5 ± 3.2	28.9 ± 5.4	<0.001
Coronary artery bypass grafting	0	26.6%	43.6%	<0.001						
History of myocardial infarction	80	26.3%	34.3%	<0.001	23.3%	33.6%	<0.001	34.5%	35.1%	0.62
History of heart failure	99	15.4%	14.0%	0.013	12.1%	11.4%	0.30	24.7%	17.4%	<0.001
New York Heart Association functional class IV	105	1.4%	7.4%	<0.001	1.5%	6.3%	<0.001	1.3%	8.7%	<0.001
Peripheral vascular disease	76	11.3%	14.7%	<0.001	8.1%	12.7%	<0.001	20.1%	17.3%	0.008
Cerebrovascular disease	75	16.4%	5.0%	<0.001	14.1%	4.1%	<0.001	22.7%	6.1%	<0.001
Valve disease	85	7.6%	6.1%	<0.001	7.7%	6.0%	0.001	7.3%	6.2%	0.12
Renal insufficiency	195	6.4%	11.4%	<0.001	5.8%	10.4%	<0.001	7.9%	12.6%	<0.001
Hemodialysis	0	4.0%	1.1%	<0.001	3.7%	1.2%	<0.001	4.7%	0.9%	<0.001
Hypertension	73	69.5%	74.3%	<0.001	69.0%	72.8%	<0.001	70.7%	76.1%	<0.001
Diabetes mellitus	76	39.2%	31.0%	<0.001	36.5%	27.6%	<0.001	46.6%	35.5%	<0.001
Hyperlipidemia	87	51.3%	61.5%	<0.001	50.2%	62.1%	<0.001	54.4%	60.8%	<0.001
Family history of coronary artery disease	537	15.7%	33.9%	<0.001	15.4%	34.5%	<0.001	16.6%	33.1%	<0.001
Smoking	238	52.9%	46.0%	<0.001	52.5%	44.7%	<0.001	54.1%	47.7%	<0.001

Methods

The Coronary Revascularization Demonstrating Outcome database in Kyoto (CREDO-Kyoto) was a multicenter (n = 29) registry maintained in Kyoto, Japan. The Texas Heart Institute Research Database (THIRDBase) is an ongoing single-center registry maintained at the Texas Heart Institute in Houston, Texas. Details concerning the design of the CREDO-Kyoto and THIRDBase have previously been reported.[5,6] Both of these comprehensive, longitudinal, clinical registries of patients undergoing coronary revascularization procedures were designed to evaluate associated periprocedural and late events. CREDO-Kyoto enrolled patients from 2000 to 2002, and the THIRDBase has been a continuous, on-going registry since 1993. For the present analysis, we included only those THIRDBase patients enrolled from 1999 to 2003, to match the total number of patients in the CREDO-Kyoto registry. In both countries, all the study patients had undergone initial, elective, isolated revascularization procedures. All PCI patients had undergone placement of a bare metal stent (drug-eluting stents were not available for this use during the study period). The patients were excluded if they had undergone previous PCI or CABG, required valve surgery or peripheral vascular revascularization, or were undergoing primary PCI for an acute myocardial infarction (MI).

The baseline data regarding the patients' clinical characteristics were obtained prospectively from both registries. The coronary anatomic and procedural characteristics, in-hospital outcomes, and vital status as of December 31, 2006 were assessed for all patients. For the THIRDBase, survivorship was determined from the US Department of Vital Statistics Database. For CREDO-Kyoto, the follow-up data were obtained from hospital charts or by interviewing the patients or referring physicians. Both registries had remarkably high follow-up completion rates (THIRDBase 100%; CREDO-Kyoto 98% at 1 year and 95% at 2 years). The survival analyses included both in-hospital and long-term survival data, and these survival rates were not considered separately.

Each patient's history was obtained by interview when the patient arrived at the hospital or clinic, and the details were entered prospectively into the database. The following variables were documented: left ventricular ejection fraction, number of diseased vessels, urgency of the revascularization procedure, presence of hypertension (characterized by blood pressure of >130/90 mm Hg or the current use of antihypertensive medications), severity of angina (Canadian Cardiovascular Society classification), severity of congestive heart failure (New York Heart Association functional status), family history of CAD, previous MI, renal function, need for hemodialysis, presence of diabetes mellitus (characterized by a fasting blood sugar level of >6.87 mmol/L or the use of antidiabetic agents), and the presence of peripheral vascular disease (occlusive or aneurismal vascular disease in the aorta or other peripheral vessels).

The institutional review board of THIRDBase approved the present study. All enrollees provided written informed consent at hospital admission. All analyzed data were stripped of personal identifiers. For CREDO-Kyoto, owing to the retrospective nature of enrollment, the patients had not provided written informed consent; however, when later interviewed for the follow-up evaluation, 73 patients were excluded from the analysis because of their refusal to par-

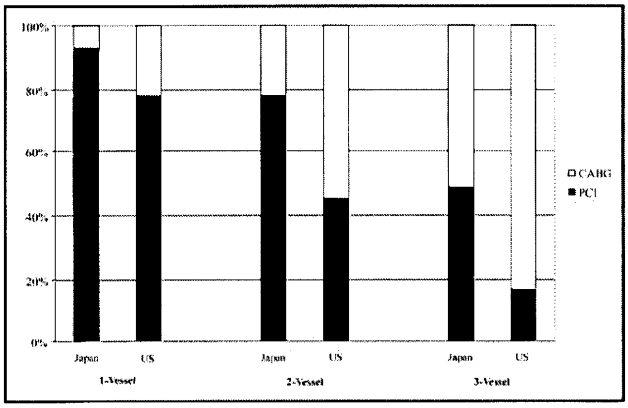


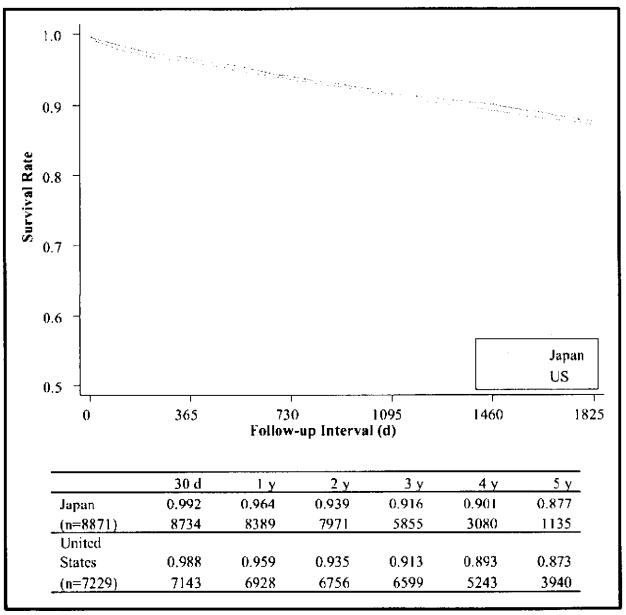
Figure 1. Proportion of PCI and CABG procedures according to number of diseased vessels.

ticipate in the study. This process was concordant with the guidelines for epidemiologic studies issued by the Ministry of Health, Labor, and Welfare of Japan.

To compare the 2 registries, we assessed the demographic characteristics and in-hospital mortality, using Pearson's chi-square test for discrete variables and Student's *t* test for continuous variables. We then used the Kaplan-Meier method to draw the survival curve and the log-rank test to identify significant differences in the unadjusted survival rates. We also compared the 2 registries with respect to the survival rates among the subgroups of patients undergoing PCI versus CABG. Logistic regression analysis and Cox proportional hazards models were used to examine the differences in demographic and clinical characteristics with regard to short- and long-term survival, respectively. Multivariate analyses were performed to control for possible confounding factors affecting the association between the registry and outcomes. The variables included in the multivariate models were age ≤65 years, gender, obesity, procedure type (PCI or CABG), history of MI, heart failure, New York Heart Association functional class, peripheral vascular disease, renal function, hemodialysis, hypertension, diabetes, hyperlipidemia, family history of CAD, smoking, the number of diseased vessels, and the geographic location of the registry. Renal function was characterized by a serum creatinine level of ≤179 μmol/L, a serum creatinine level of >179 μmol/L without hemodialysis, and a serum creatinine level of >179 μmol/L with hemodialysis. Cerebrovascular disease was excluded from the multivariate analyses because of differences in the definition of such disease by the 2 registries. To assess the validity of the proportional hazards assumption, we plotted −log [−log(survival)] curves for each category of nominal or ordinal covariates versus the log (analysis time). Because the proportional hazards assumption did not hold for the mode of coronary revascularization, the stratified Cox proportional hazards model using the revascularization procedure selected as the stratification variable was applied for the analysis of the long-term outcomes. Separate models were generated for the subgroups of patients with a high-risk profile (e.g., age ≥65 years, male gender, obesity, hemodialysis, diabetes, and a greater number of diseased vessels). The modeling procedure was performed for the cases for which the necessary data were available (complete case analysis) using Stata, version 10.1, software (StataCorp, College Station, Texas). All tests of significance were 2 tailed, and p values of <0.05 were considered significant.

Table 2
Risk of in-hospital mortality according to multivariable logistic regression analysis

Variable	Odds Ratio	95% Confidence Interval
Age ≥65 years	2.31	1.53–3.51
Women	1.24	0.83–1.85
Body mass index ≥25 kg/m^2	0.78	0.51–1.18
Coronary artery bypass grafting	3.90	2.53–6.03
Previous myocardial infarction	1.48	1.04–2.13
History of heart failure	2.14	1.43–3.21
New York Heart Association functional class IV	1.13	0.61–2.10
Peripheral vascular disease	1.75	1.19–2.57
Renal function		
Serum creatinine ≤179 μmol/L	1.00	—
Serum creatinine >179 μmol/L	2.97	1.85–4.77
Hemodialysis	5.46	3.10–9.63
Hypertension	1.16	0.75–1.80
Diabetes mellitus	1.50	1.04–2.16
Hyperlipidemia	0.65	0.45–0.93
Family history of coronary artery disease	1.00	0.64–1.56
Smoking	1.56	1.07–2.29
No. of diseased vessels		
1 Vessel	1.00	—
2 Vessels	1.47	0.86–2.51
3 Vessels	1.82	1.05–3.15
United States patients	1.31	0.82–2.08

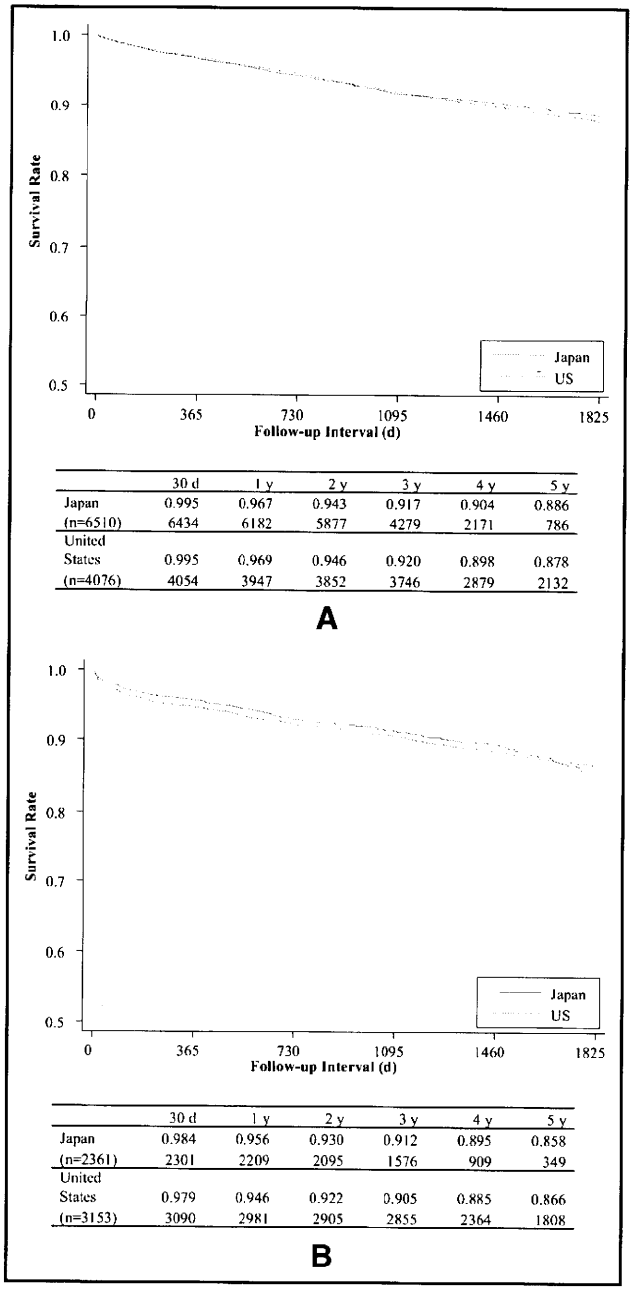


	30 d	1 y	2 y	3 y	4 y	5 y
Japan	0.992	0.964	0.939	0.916	0.901	0.877
(n=8871)	8734	8389	7971	5855	3080	1135
United States	0.988	0.959	0.935	0.913	0.893	0.873
(n=7229)	7143	6928	6756	6599	5243	3940

Figure 2. Kaplan-Meier survival curve for all patients (log-rank test, p = 0.35).

Results

The series included 16,100 patients—8,871 patients from the CREDO-Kyoto registry (median follow-up period



	30 d	1 y	2 y	3 y	4 y	5 y
Japan	0.995	0.967	0.943	0.917	0.904	0.886
(n=6510)	6434	6182	5877	4279	2171	786
United States	0.995	0.969	0.946	0.920	0.898	0.878
(n=4076)	4054	3947	3852	3746	2879	2132

A

	30 d	1 y	2 y	3 y	4 y	5 y
Japan	0.984	0.956	0.930	0.912	0.895	0.858
(n=2361)	2301	2209	2095	1576	909	349
United States	0.979	0.946	0.922	0.905	0.885	0.866
(n=3153)	3090	2981	2905	2855	2364	1808

B

Figure 3. Kaplan-Meier survival curves for PCI and CABG subgroups. *(A)* PCI subgroup (log-rank test, p = 0.53). *(B)* CABG subgroup (log-rank test, p = 0.95).

3.5 years, interquartile range 2.6 to 4.3) and 7,229 patients from the THIRDBase registry (median follow-up period 5.2 years, interquartile range 3.8 to 6.5). The Japanese patients were older and were more likely to be smokers and to have diabetes mellitus and cerebrovascular disease (Table 1). The US patients were more obese, with a greater body mass index. In general, the US patients had a greater prevalence of MI, renal insufficiency, and hypertension. Multivessel disease was seen more frequently in the Japanese patients than in the US patients.

The foregoing trends were also seen when the PCI and CABG patients were analyzed separately (Table 1), except

Table 3
Risk of long-term mortality for each registry according to univariate analysis using stratified Cox proportional hazards model with revascularization procedure as stratification variable

Variable	Japan		United States	
	HR	95% CI	HR	95% CI
Age ≥65 years	2.74	2.29–3.27	3.01	2.65–3.43
Women	1.04	0.90–1.20	1.43	1.26–1.63
Hypertension	1.09	0.94–1.27	1.77	1.51–2.08
Diabetes mellitus	1.39	1.22–1.59	1.78	1.57–2.02
Hyperlipidemia	0.59	0.51–0.67	0.61	0.54–0.69
Family history of coronary artery disease	0.66	0.53–0.82	0.65	0.56–0.74
Smoking	0.91	0.80–1.05	1.08	0.96–1.22
Body mass index ≥25 kg/m^2	0.46	0.38–0.55	0.56	0.49–0.64
Previous myocardial infarction	1.45	1.26–1.67	1.36	1.21–1.54
History of heart failure	3.13	2.71–3.62	3.56	3.12–4.07
New York Heart Association class IV	3.17	2.25–4.46	2.96	2.50–3.50
Peripheral vascular disease	2.20	1.86–2.60	2.60	2.27–2.98
Cerebrovascular disease	1.78	1.52–2.07	2.42	1.98–2.97
Renal function				
Serum creatinine level ≤179 μmol/L	1.00	—	1.00	—
Serum creatinine level >179 μmol/L	6.98	5.54–8.78	2.68	2.30–3.13
Hemodialysis	6.12	5.07–7.40	8.83	6.68–11.7
No. of diseased vessels:				
1 Vessel	1.00	—	1.00	—
2 Vessels	1.48	1.23–1.78	1.22	1.04–1.43
3 Vessels	2.09	1.74–2.52	1.59	1.31–1.93
Left anterior descending artery disease	1.26	1.05–1.51	0.99	0.87–1.14
Left circumflex artery disease	1.43	1.23–1.65	1.30	1.14–1.49
Right coronary artery disease	1.59	1.37–1.85	1.21	1.06–1.37

CI, confidence interval; HR, hazard ratio.

that the Japanese CABG patients had a greater prevalence of peripheral vascular disease. In Japan, the proportion of PCI versus CABG procedures did not differ among patients with single-vessel disease, but PCI was performed more frequently in patients with multivessel disease (Figure 1). To treating 3-vessel disease, CABG was preferred in the US (82.2%), but PCI and CABG were performed with a similar frequency in Japan (48.5% and 51.5%, respectively).

Both registries had similar in-hospital outcomes, regardless of the revascularization procedure used. Overall, the in-hospital mortality rate was 0.9% for the Japanese patients and 1.1% for the US patients (p = 0.19), indicating that the procedural complication rates were similar between the 2 groups. When the in-hospital mortality rate was analyzed according to the revascularization procedure performed, it was similar for both PCI (0.45% in Japan vs 0.27% in the United Stages; p = 0.15) and CABG (2.2% in Japan vs 2.3% in the US; p = 0.99). Table 2 lists the multivariate predictors of in-hospital outcome. When the results were adjusted for these confounding variables, the US patients had a greater risk of in-hospital death compared to the Japanese patients (odds ratio 1.60, 95% confidence interval 1.02 to 2.51; p = 0.039).

The crude long-term mortality rate was similar in both Japan and the US (27.7 vs 28.2/1,000 person-years, respec-