

Thoracic and cardiovascular surgery in Japan during 2004

Annual report by the Japanese Association for Thoracic Surgery

Committee for Scientific Affairs

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Since 1986, the Japanese Association for Thoracic Surgery has conducted annual surveys of thoracic surgery to determine the statistics regarding the number of procedures according to the operative category throughout the country. Here we summarize the results from our annual survey of thoracic surgery performed during 2004.

The incidence of hospital mortality was added to this survey to determine the nationwide status, which can be useful not only for surgeons to compare their work with that of others but also for the association to gain a better understanding of any present problems as well as future prospects. Thirty-day mortality (sometimes termed operative mortality) is death within 30 days of operation regardless of the patient's geographic location. It includes death within 30 days of operation even when the patient has been discharged from the hospital within those 30 days.

Hospital mortality is death within any time interval after operation if the patient has not been discharged from the hospital. Hospital-to-hospital transfer is not

considered discharge; transfer to a nursing home or a rehabilitation unit is considered hospital discharge unless the patient subsequently dies of complications of the operation. The definitions of terms are based on the published guidelines of the Society of Thoracic Surgeons and the American Association for Thoracic Surgery.¹

Thoracic surgery was classified into three categories—cardiovascular, general thoracic, esophageal surgery—and the pertinent data were examined and analyzed for each group. Access to the computerized data is offered to all members of this association. We honor and value your continued kind support.

Abstract of the Survey

We sent out survey questionnaires to the departments of each of the three categories in all 2068 institutions nationwide during early June 2004. The response rates for each category by the end of December 2005 were 90.3%, 91.1%, and 79.3% for cardiovascular, general thoracic, and esophageal surgery, respectively.

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This is the annual report by The Japanese Association for Thoracic Surgery from the Committee for Scientific Affairs

Questionnaires sent out and received back by the end of December 2005

	Sent out	Returned	Response rate
(A) Cardiovascular surgery	597	539	90.3%
(B) General thoracic surgery	738	672	91.1%
(C) Esophageal surgery	733	581	79.3%

Categories subclassified according to the number of operations performed

Number of operations performed	Category		
	Cardiovascular surgery	General thoracic surgery	Esophageal surgery
1–24	69	150	467
25–49	111	158	61
50–99	168	190	32
100–149	74	93	9
150–199	49	47	6
≥200	68	34	6
Total	539	672	581

Final report 2004

(A) Cardiovascular surgery

Figure 1 shows the development of cardiovascular surgery in Japan over the last 19 years. Aneurysm surgery includes only operations for thoracic or thoracoabdominal aortic aneurysms. The number of pacemaker and assist device implantation operations is not included in the total number of surgical operations. A total of 52,434 cardiovascular operations were performed at 539 institutions during 2004 alone and included 5 cardiac transplantation operations, which were started in 2002. In comparison with 2003, the number of operations for valvular heart disease increased by 6.7%, and that for thoracic aortic aneurysms increased by 14.3%. Surgery for congenital heart disease increased by 4.1%. In contrast, operations for ischemic heart disease decreased by 6.5%.

Data for individual categories are summarized in Tables 1–7. For the 7,380 open-heart operations performed for congenital heart disease, the hospital mortality was 3.9%, similar to that in 2003 (3.7%). The hospital mortality for 2,165 palliative operations was 3.2%, decreasing from the 3.6% hospital mortality for this category in 2003.

Isolated mitral valve repair constituted 30.6% of all valvular heart disease operations (12,626), similar to that in 2003 (31.3%). The hospital mortality for primary operations for valvular heart disease was 4.1%, whereas the hospital mortality for redo operations was 9.3%, which although somewhat lower than the 11.4% mortality in 2003 was still high.

Isolated coronary artery bypass grafting was performed in 19,930 cases, with an overall hospital mortality of 2.6%. The hospital mortality associated with elective surgery was

1.6%. The hospital mortality of emergency operations was 9.1%, which had decreased from the 12.1% mortality in 2003 but was still high. Off-pump coronary bypass grafting (OPCAB) was performed in 12,018 cases, which constituted 60.3% of the total number of isolated coronary bypass grafts. In comparison with 2003, the percentage of OPCAB among the total isolated coronary bypass graft cases increased from 55.2% to 60.3%.

A total of 823 patients had surgery for complications of myocardial infarction, including 450 operations for a left ventricular aneurysm or infarction. Operations for a dissecting aneurysm were performed in 3,858 patients with an overall hospital mortality of 13.1%. Operations for nondissecting aneurysm were carried out in 4,299 patients, with an overall hospital mortality of 9.2%. The hospital mortality for unruptured aneurysms was 6.2%, and that for ruptured aneurysms was 29.8%, which remained high. A small improvement, however, was noted in the operative mortality for dissecting and nondissecting aneurysms compared to that in 2003.

The number of stent-graft procedures has increased year by year. A total of 166 patients with dissecting aortic aneurysms underwent stent-graft placement (endovascular stent-raftering 117 cases; open stent-grafting 49 cases). The hospital mortality rate was 4.2%. A total of 440 patients with nondissecting aortic aneurysms underwent stent-graft placement (endovascular stent-grafting 332 cases; open stent-grafting 108 cases). The hospital mortality rate was 7.7%.

In summary, the total number of cardiovascular operations increased 1.6% during the year 2004. Moreover, they were performed with steadily improving results in all categories compared to the figures for 2003.

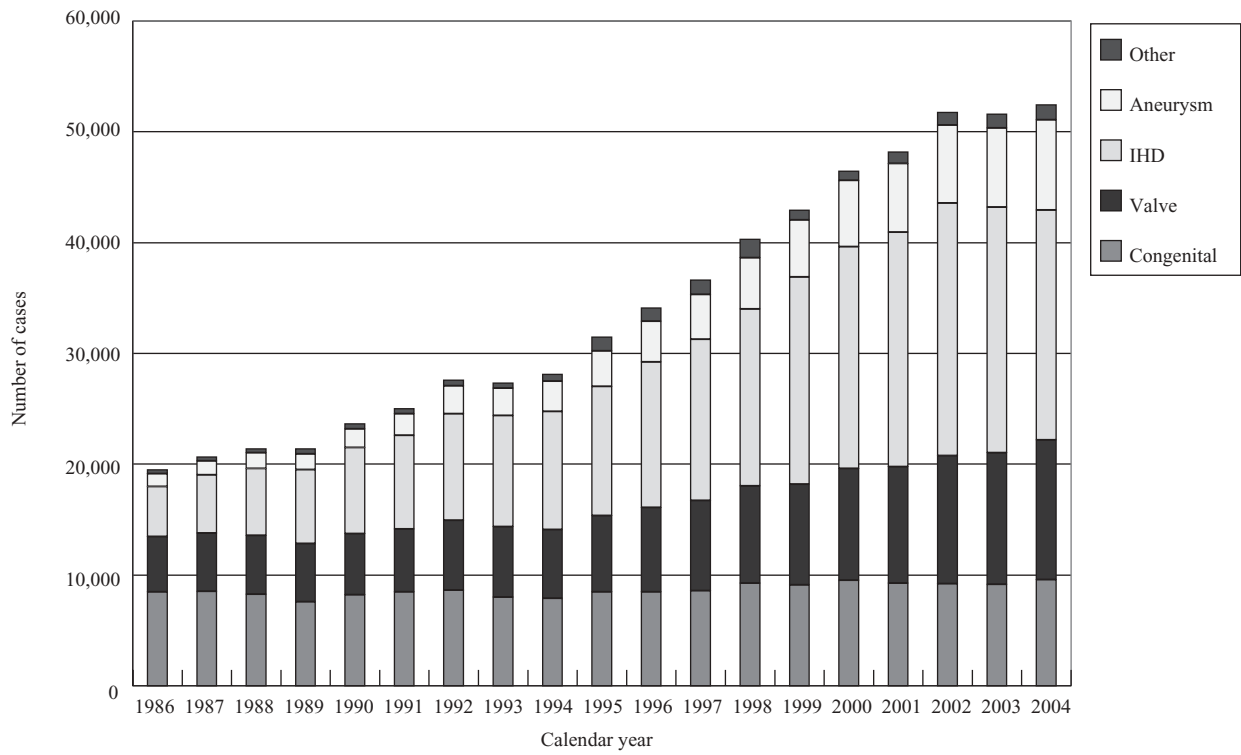


Fig. 1 Cardiovascular surgery

Table 1 Congenital (total; 9,545)

(1) CPB (+) (total; 7,380)

in 2004

		Neonate			Infant			1–17 years			≥18 years			Total		
		Cases	Deaths	HD	Cases	Deaths	HD	Cases	Deaths	HD	Cases	Deaths	HD	Cases	Deaths	HD
1	PDA	6	0	0	5	1 (20.0)	1 (20.0)	0	0	0	32	0	0	43	1 (2.3)	1 (2.3)
2	Coarctation (simple)	2	0	0	3	0	0	8	0	0	9	0	0	22	0	0
3	+VSD	39	1 (2.6)	1 (2.6)	38	1 (2.6)	2 (5.3)	11	0	1 (9.1)	5	0	0	93	2 (2.2)	4 (4.3)
4	+DORV	4	1 (25.0)	1 (25.0)	7	1 (14.3)	2 (28.6)	1	0	0	0	0	0	12	2 (16.7)	3 (25.0)
5	+AVSD	3	1 (33.3)	1 (33.3)	3	1 (33.3)	1 (33.3)	0	0	0	1	0	0	7	2 (28.6)	2 (28.6)
6	+TGA	9	1 (11.1)	2 (22.2)	2	0	1 (50.0)	0	0	0	0	0	0	11	1 (9.1)	3 (27.3)
7	+SV	4	0	1 (25.0)	2	0	0	2	0	0	1	0	0	9	0	1 (11.1)
8	+Others	4	0	0	6	0	0	4	0	0	1	0	0	15	0	0
9	Interrupt. of Ao (simple)	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0
10	+VSD	26	2 (7.7)	2 (7.7)	8	0	0	1	0	0	5	0	0	40	2 (5.0)	2 (5.0)
11	+DORV	1	1 (100.0)	1 (100.0)	1	0	0	1	0	0	0	0	0	3	1 (33.3)	1 (33.3)
12	+Truncus	1	0	0	1	0	0	0	0	0	0	0	0	2	0	0
13	+TGA	3	1 (33.3)	1 (33.3)	0	0	0	0	0	0	0	0	0	3	1 (33.3)	1 (33.3)
14	+Others	5	1 (20.0)	1 (20.0)	3	0	0	1	0	0	1	0	0	10	1 (10.0)	1 (10.0)
15	Vascular ring	0	0	0	4	0	1 (25.0)	4	0	0	2	0	0	10	0	1 (10.0)
16	PS	0	0	0	3	1 (33.3)	1 (33.3)	24	0	1 (4.2)	8	0	0	35	1 (2.9)	2 (5.7)
17	PPA or Critical PS	10	1 (10.0)	1 (10.0)	30	2 (6.7)	3 (10.0)	71	0	1 (1.4)	3	1 (33.3)	1 (33.3)	114	4 (3.5)	6 (5.3)
18	TAPVR	91	18 (19.8)	18 (19.8)	57	5 (8.8)	5 (8.8)	7	1 (14.3)	1 (14.3)	3	0	0	158	24 (15.2)	24 (15.2)
19	PAPVR ± ASD	0	0	0	3	0	0	72	0	0	27	1 (3.7)	1 (3.7)	102	1 (1.0)	1 (1.0)
20	ASD	11	0	0	60	1 (1.7)	1 (1.7)	971	0	0	898	3 (0.3)	4 (0.4)	1,940	4 (0.2)	5 (0.3)
21	Cor triatriatum	3	0	1 (33.3)	6	0	1 (16.7)	4	0	0	1	0	0	14	0	2 (14.3)
22	AVSD (partial)	0	0	0	21	0	0	61	1 (1.6)	1 (1.6)	25	1 (4.0)	1 (4.0)	107	2 (1.9)	2 (1.9)
23	AVSD (complete)	0	0	0	104	4 (3.8)	5 (4.8)	61	3 (4.9)	4 (6.6)	3	0	0	168	7 (4.2)	9 (5.4)
24	+TOF or DORV	1	0	0	10	1 (10.0)	1 (10.0)	26	1 (3.8)	1 (3.8)	0	0	0	37	2 (5.4)	2 (5.4)
25	+Others	2	0	0	7	2 (28.6)	2 (28.6)	2	0	0	0	0	0	11	2 (18.2)	2 (18.2)
26	VSD (subarterial)	2	1 (50.0)	1 (50.0)	108	0	0	301	1 (0.3)	1 (0.3)	41	0	1 (2.4)	452	2 (0.4)	3 (0.7)
27	VSD (perimemb/muscular)	9	0	0	662	3 (0.5)	5 (0.8)	441	1 (0.2)	1 (0.2)	70	0	0	1,182	4 (0.3)	6 (0.5)
28	VSD + PS	0	0	0	37	0	0	40	0	0	7	0	0	84	0	0
29	DCRV ± VSD	0	0	0	13	0	0	40	0	0	11	0	0	64	0	0
30	Aneurysm of sinus Valsalva	1	0	0	1	0	0	1	0	0	37	1 (2.7)	1 (2.7)	40	1 (2.5)	1 (2.5)
31	TOF	3	0	0	111	4 (3.6)	6 (5.4)	312	4 (1.3)	4 (1.3)	22	1 (4.5)	1 (4.5)	448	9 (2.0)	11 (2.5)
32	PA + VSD	1	0	0	39	2 (5.1)	7 (17.9)	86	4 (4.7)	4 (4.7)	4	3 (75.0)	3 (75.0)	130	9 (6.9)	14 (10.8)
33	DORV	14	4 (28.6)	5 (35.7)	82	4 (4.9)	6 (7.3)	126	2 (1.6)	4 (3.2)	5	0	0	227	10 (4.4)	15 (6.6)
34	TGA (simple)	113	4 (3.5)	8 (7.1)	12	1 (8.3)	1 (8.3)	2	0	0	0	0	0	127	5 (3.9)	9 (7.1)
35	+VSD	34	4 (11.8)	5 (14.7)	18	1 (5.6)	1 (5.6)	9	0	0	0	0	0	61	5 (8.2)	6 (9.8)
36	VSD + PS	2	0	1 (50.0)	5	1 (20.0)	1 (20.0)	14	0	0	3	0	1 (33.3)	24	1 (4.2)	3 (12.5)
37	Corrected TGA	0	0	0	17	2 (11.8)	2 (11.8)	38	1 (2.6)	2 (5.3)	5	0	1 (20.0)	60	3 (5.0)	5 (8.3)
38	Truncus arteriosus	8	2 (25.0)	3 (37.5)	9	3 (33.3)	3 (33.3)	3	1 (33.3)	1 (33.3)	1	0	0	21	6 (28.6)	7 (33.3)
39	SV	33	10 (30.3)	11 (33.3)	136	7 (5.1)	10 (7.4)	282	7 (2.5)	14 (5.0)	22	3 (13.6)	5 (22.7)	473	27 (5.7)	40 (8.5)
40	TA	1	0	0	26	0	2 (7.7)	55	1 (1.8)	1 (1.8)	9	0	1 (11.1)	91	1 (1.1)	4 (4.4)
41	HLHS	58	22 (37.9)	27 (46.6)	66	12 (18.2)	16 (24.2)	30	0	0	1	0	0	155	34 (21.9)	43 (27.7)
42	Aortic valve lesion	4	2 (50.0)	3 (75.0)	10	2 (20.0)	2 (20.0)	93	2 (2.2)	4 (4.3)	32	1 (3.1)	1 (3.1)	139	7 (5.0)	10 (7.2)
43	Mitral valve lesion	1	1 (100.0)	1 (100.0)	18	2 (11.1)	2 (11.1)	52	1 (1.9)	1 (1.9)	15	0	0	86	4 (4.7)	4 (4.7)
44	Ebstein	4	0	0	8	0	0	12	0	0	24	1 (4.2)	2 (8.3)	48	1 (2.1)	2 (4.2)
45	Coronary disease	1	0	0	14	1 (7.1)	1 (7.1)	17	0	0	20	1 (5.0)	1 (5.0)	52	2 (3.8)	2 (3.8)
46	Others	18	3 (16.7)	4 (22.2)	25	6 (24.0)	7 (28.0)	56	4 (7.1)	5 (8.9)	19	0	0	118	13 (11.0)	16 (13.6)
47	Redo VSD	1	0	0	5	0	0	14	0	0	5	0	0	25	0	0
48	PS release	1	0	0	9	0	0	69	0	0	17	0	0	96	0	0
49	RV-PAconduit replace	0	0	0	1	0	0	45	1 (2.2)	1 (2.2)	26	1 (3.8)	1 (3.8)	72	2 (2.8)	2 (2.8)
50	Others	2	0	0	34	3 (8.8)	4 (11.8)	63	2 (3.2)	5 (7.9)	38	2 (5.3)	2 (5.3)	137	7 (5.1)	11 (8.0)
	Total	538	81 (15.1)	100 (18.6)	1,850	74 (4.0)	103 (5.6)	3,533	38 (1.1)	58 (1.6)	1,459	20 (1.4)	28 (1.9)	7,380	213 (2.9)	289 (3.9)

CPB, Cardiopulmonary bypass; HD, Hospital deaths; (), mortality %; PPA, pure pulmonary atresia; DCRV, double chambered right ventricle; PA, pulmonary atresia; SV, single ventricle; TA, tricuspid atresia

Table 1 Congenital (total; 9,545)

(2) CPB (-) (total; 2,165)

in 2004

		Neonate			Infant			1–17 years			≥18 years			Total		
		Cases	Deaths	HD	Cases	Deaths	HD	Cases	Deaths	HD	Cases	Deaths	HD	Cases	Deaths	HD
1	PDA	304	8 (2.6)	10 (3.3)	205	1 (0.5)	3 (1.5)	122	0	0	4	0	0	635	9 (1.4)	13 (2.0)
2	Coarctation (simple)	20	0	1 (5.0)	17	0	0	5	0	0	2	0	0	44	0	1 (2.3)
3	+VSD	38	4 (10.5)	5 (13.2)	26	0	1 (3.8)	1	0	0	0	0	0	65	4 (6.2)	6 (9.2)
4	+DORV	11	1 (9.1)	2 (18.2)	1	0	0	0	0	0	0	0	0	12	1 (8.3)	2 (16.7)
5	+AVSD	9	0	0	1	0	0	0	0	0	0	0	0	10	0	0
6	+TGA	5	1 (20.0)	1 (20.0)	1	0	0	0	0	0	0	0	0	6	1 (16.7)	1 (16.7)
7	+SV	10	1 (10.0)	1 (10.0)	4	0	0	1	0	0	0	0	0	15	1 (6.7)	1 (6.7)
8	+Others	11	2 (18.2)	2 (18.2)	5	0	0	1	0	0	1	0	0	18	2 (11.1)	2 (11.1)
9	Interrupt. of Ao (simple)	1	1 (100)	1 (100.0)	1	0	0	0	0	0	0	0	0	2	1 (50.0)	1 (50.0)
10	+VSD	11	1 (9.1)	1 (9.1)	2	0	0	0	0	0	0	0	0	13	1 (7.7)	1 (7.7)
11	+DORV	2	0	0	0	0	0	1	0	0	0	0	0	3	0	0
12	+Truncus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	+TGA	2	0	0	1	0	1 (100)	0	0	0	0	0	0	3	0	1 (33.3)
14	+Others	5	0	1 (20.0)	2	1 (50.0)	1 (50.0)	0	0	0	0	0	0	7	1 (14.3)	2 (28.6)
15	Vascular ring	1	1 (100)	1 (100.0)	6	1 (16.7)	1 (16.7)	2	0	0	0	0	0	9	2 (22.2)	2 (22.2)
16	PS	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0
17	PPA or Critical PS	20	2 (10.0)	2 (10.0)	40	2 (5.0)	5 (12.5)	5	1 (20.0)	1 (20.0)	0	0	0	65	5 (7.7)	8 (12.3)
18	TAPVR	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
19	PAPVR ± ASD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	ASD	0	0	0	0	0	0	0	0	0	12	0	0	12	0	0
21	Cor triatriatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	AVSD (partial)	1	0	1 (100.0)	0	0	0	0	0	0	0	0	0	1	0	1 (100.0)
23	AVSD (complete)	11	0	1 (9.1)	47	1 (2.1)	1 (2.1)	1	0	0	1	0	0	60	1 (1.7)	2 (3.3)
24	+TOF or DORV	2	0	0	14	1 (7.1)	1 (7.1)	2	0	0	0	0	0	18	1 (5.6)	1 (5.6)
25	+Others	4	0	0	7	0	0	2	0	0	0	0	0	13	0	0
26	VSD (subarterial)	1	0	0	4	0	0	0	0	0	0	0	0	5	0	0
27	VSD (perimemb/muscular)	23	1 (4.3)	1 (4.3)	76	0	0	4	0	0	0	0	0	103	1 (1.0)	1 (1.0)
28	VSD + PS	1	0	0	5	0	0	1	0	0	0	0	0	7	0	0
29	DCRV ± VSD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	Aneurysm of sinus Valsalva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	TOF	30	0	0	110	0	0	14	0	0	1	0	0	155	0	0
32	PA + VSD	23	0	0	82	1 (1.2)	2 (2.4)	37	0	0	1	0	0	143	1 (0.7)	2 (1.4)
33	DORV	31	0	0	58	2 (3.4)	2 (3.4)	13	0	0	1	0	0	103	2 (1.9)	2 (1.9)
34	TGA (simple)	9	0	0	2	0	0	1	0	0	0	0	0	12	0	0
35	+VSD	2	0	0	7	0	0	2	0	0	0	0	0	11	0	0
36	VSD + PS	6	0	0	8	0	0	2	0	0	0	0	0	16	0	0
37	Corrected TGA	12	1 (8.3)	1 (8.3)	13	0	0	8	0	0	0	0	0	33	1 (3.0)	1 (3.0)
38	Truncus arteriosus	7	1 (14.3)	1 (14.3)	3	0	0	2	0	0	0	0	0	12	1 (8.3)	1 (8.3)
39	SV	60	1 (1.7)	2 (3.3)	95	3 (3.2)	3 (3.2)	28	0	0	3	0	0	186	4 (2.2)	5 (2.7)
40	TA	18	0	0	25	0	0	8	1 (12.5)	1 (12.5)	1	0	0	52	1 (1.9)	1 (1.9)
41	HLHS	35	1 (2.9)	4 (11.4)	11	1 (9.1)	1 (9.1)	2	0	0	0	0	0	48	2 (4.2)	5 (10.4)
42	Aortic valve lesion	2	0	0	1	0	0	0	0	0	1	0	0	4	0	0
43	Mitral valve lesion	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	Ebstein	3	0	0	3	0	0	0	0	0	0	0	0	6	0	0
45	Coronary disease	0	0	0	1	0	0	1	0	0	2	0	0	4	0	0
46	Others	37	1 (2.7)	1 (2.7)	54	1 (1.9)	1 (1.9)	69	0	0	6	0	0	166	2 (1.2)	2 (1.2)
47	Redo VSD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	PS release	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
49	RV-PAconduit replace	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0
50	Others	27	1 (3.7)	1 (3.7)	27	0	1 (3.7)	26	0	0	4	2 (50.0)	2 (50.0)	84	3 (3.6)	4 (4.8)
	Total	795	29 (3.6)	41 (5.2)	967	15 (1.6)	24 (2.5)	363	2 (0.6)	2 (0.6)	40	2 (5.0)	2 (5.0)	2,165	48 (2.2)	69 (3.2)

HD, Hospital deaths; (), mortality %

(3) Main procedure

in 2004

		Neonate			Infant			1–17 years		
		Cases	Deaths	HD	Cases	Deaths	HD	Cases	Deaths	HD
1	SP Shunt	176	4 (2.3)	4 (2.3)	424	13 (3.1)	16 (3.8)	72	1 (1.4)	1 (1.4)
2	PAB	198	10 (5.1)	12 (6.1)	209	2 (1.0)	4 (1.9)	17	0 (0.0)	0 (0.0)
3	Glenn ± α	6	2 (33.3)	2 (33.3)	204	8 (3.9)	14 (6.9)	161	3 (1.9)	5 (3.1)
4	PA Reconstruction/Plasty (Including Redo)	13	1 (7.7)	1 (7.7)	80	0 (0.0)	2 (2.5)	92	1 (1.1)	1 (1.1)
5	RVOT Reconstruction/Plasty	6	1 (16.7)	3 (50.0)	103	7 (6.8)	9 (8.7)	245	4 (1.6)	4 (1.6)
6	Rastelli Procedure	10	2 (20.0)	4 (40.0)	21	1 (4.8)	2 (9.5)	84	3 (3.6)	3 (3.6)
7	Arterial Switch Procedure	160	12 (7.5)	18 (11.3)	39	3 (7.7)	4 (10.3)	18	2 (11.1)	2 (11.1)
8	Atrial Switch Procedure	1	0 (0.0)	0 (0.0)	4	0 (0.0)	0 (0.0)	2	0 (0.0)	0 (0.0)
9	Double Switch Procedure	0	0 (0.0)	0 (0.0)	2	1 (50.0)	1 (50.0)	6	0 (0.0)	1 (16.7)
10	Repair of Anomalous Origin of CA	0	0 (0.0)	0 (0.0)	10	1 (10.0)	1 (10.0)	8	0 (0.0)	0 (0.0)
11	Closure of Coronary AV Fistula	1	0 (0.0)	0 (0.0)	4	0 (0.0)	0 (0.0)	5	0 (0.0)	0 (0.0)
12	Fontan / TCPC	0	0 (0.0)	0 (0.0)	8	0 (0.0)	0 (0.0)	304	4 (1.3)	9 (3.0)
13	Norwood Procedure	65	21 (32.3)	26 (40.0)	32	11 (34.4)	13 (40.6)	5	0 (0.0)	0 (0.0)
14	Ventricular Septation	0	0 (0.0)	0 (0.0)	0	0 (0.0)	0 (0.0)	3	0 (0.0)	0 (0.0)
15	Left side AV Valve Plasty (Including Redo)	3	1 (33.3)	2 (66.7)	65	4 (6.2)	5 (7.7)	78	0 (0.0)	0 (0.0)
16	Left side AV Valve Replace (Including Redo)	0	0 (0.0)	0 (0.0)	8	1 (12.5)	2 (25.0)	22	2 (9.1)	2 (9.1)
17	Right side AV Valve Plasty (Including Redo)	4	0 (0.0)	0 (0.0)	15	1 (6.7)	1 (6.7)	26	1 (3.8)	1 (3.8)
18	Right side AV Valve Replace (Including Redo)	1	0 (0.0)	0 (0.0)	2	1 (50.0)	1 (50.0)	5	1 (20.0)	2 (40.0)
19	Repair of Supra-Aortic Stenosis	1	0 (0.0)	0 (0.0)	2	0 (0.0)	0 (0.0)	12	0 (0.0)	0 (0.0)
20	Repair of Subaortic Stenosis (Including Redo)	2	0 (0.0)	0 (0.0)	10	1 (10.0)	1 (10.0)	30	0 (0.0)	0 (0.0)
21	Aortic Valve Plasty ± VSD Closure	2	1 (50.0)	2 (100.0)	6	0 (0.0)	0 (0.0)	13	0 (0.0)	0 (0.0)
22	Aortic Valve Replacement	0	0 (0.0)	0 (0.0)	1	0 (0.0)	0 (0.0)	29	0 (0.0)	1 (3.4)
23	AVR with Annular Enlargement	0	0 (0.0)	0 (0.0)	0	0 (0.0)	0 (0.0)	10	0 (0.0)	1 (10.0)
24	Aortic Root Replace (except Ross)	0	0 (0.0)	0 (0.0)	0	0 (0.0)	0 (0.0)	6	2 (33.3)	2 (33.3)
25	Ross Procedure	0	0 (0.0)	0 (0.0)	1	1 (100.0)	1 (100.0)	36	2 (5.6)	3 (8.3)
	Total	649	55 (8.5)	74 (11.4)	1,250	56 (4.5)	77 (6.2)	1,289	26 (2.0)	38 (2.9)

		≥18 years			Total		
		Cases	Deaths	HD	Cases	Deaths	HD
1	SP Shunt	18	0 (0.0)	2 (11.1)	690	18 (2.6)	23 (3.3)
2	PAB	7	0 (0.0)	0 (0.0)	431	12 (2.8)	16 (3.7)
3	Glenn ± α	20	1 (5.0)	2 (10.0)	391	14 (3.6)	23 (5.9)
4	PA Reconstruction/Plasty (Including Redo)	9	1 (11.1)	3 (33.3)	194	3 (1.5)	7 (3.6)
5	RVOT Reconstruction/Plasty	12	0 (0.0)	1 (8.3)	366	12 (3.3)	17 (4.6)
6	Rastelli Procedure	4	0 (0.0)	0 (0.0)	119	6 (5.0)	9 (7.6)
7	Arterial Switch Procedure	0	0 (0.0)	0 (0.0)	217	17 (7.8)	24 (11.1)
8	Atrial Switch Procedure	0	0 (0.0)	0 (0.0)	7	0 (0.0)	0 (0.0)
9	Double Switch Procedure	1	0 (0.0)	0 (0.0)	9	1 (11.1)	2 (22.2)
10	Repair of Anomalous Origin of CA	1	0 (0.0)	0 (0.0)	19	1 (5.3)	1 (5.3)
11	Closure of Coronary AV Fistula	20	1 (5.0)	1 (5.0)	30	1 (3.3)	1 (3.3)
12	Fontan / TCPC	28	2 (7.1)	3 (10.7)	340	6 (1.8)	12 (3.5)
13	Norwood Procedure	0	0 (0.0)	0 (0.0)	102	32 (31.4)	39 (38.2)
14	Ventricular Septation	0	0 (0.0)	0 (0.0)	3	0 (0.0)	0 (0.0)
15	Left side AV Valve Plasty (Including Redo)	20	1 (5.0)	1 (5.0)	166	6 (3.6)	8 (4.8)
16	Left side AV Valve Replace (Including Redo)	9	0 (0.0)	0 (0.0)	39	3 (7.7)	4 (10.3)
17	Right side AV Valve Plasty (Including Redo)	24	0 (0.0)	0 (0.0)	69	2 (2.9)	2 (2.9)
18	Right side AV Valve Replace (Including Redo)	8	0 (0.0)	1 (12.5)	16	2 (12.5)	4 (25.0)
19	Repair of Supra-Aortic Stenosis	1	0 (0.0)	0 (0.0)	16	0 (0.0)	0 (0.0)
20	Repair of Subaortic Stenosis (Including Redo)	4	0 (0.0)	0 (0.0)	46	1 (2.2)	1 (2.2)
21	Aortic Valve Plasty ± VSD Closure	6	0 (0.0)	0 (0.0)	27	1 (3.7)	2 (7.4)
22	Aortic Valve Replacement	20	1 (5.0)	1 (5.0)	50	1 (2.0)	2 (4.0)
23	AVR with Annular Enlargement	4	0 (0.0)	0 (0.0)	14	0 (0.0)	1 (7.1)
24	Aortic Root Replace (except Ross)	7	0 (0.0)	0 (0.0)	13	2 (15.4)	2 (15.4)
25	Ross Procedure	9	2 (22.2)	2 (22.2)	46	5 (10.9)	6 (13.0)
	Total	232	9 (3.9)	17 (7.3)	3,420	146 (4.3)	206 (6.0)

HD, Hospital deaths; (), mortality %

Table 2 Acquired (total, (1) + (2) + (4) + (5) + (6) + (7) + isolated operation for arrhythmia in (3); 34,624

(1) Valvular heart disease (total; 12,626)

in 2004

	Valve	Cases	Operation				Replace		Plasty		Redo		
			Mechanical	Bioprosthesis	Plasty	with CABG	Deaths	HD	Deaths	HD	Cases	Deaths	HD
Isolated	A	5,347	2,768	2,532	47	925	142 (2.7)	177 (3.3)	4 (8.5)	4 (8.5)	232	13 (6)	15 (6.5)
	M	3,871	1,439	496	1,936	510	68 (3.5)	90 (4.7)	19 (1.0)	27 (1.4)	315	16 (5)	24 (7.6)
	T	164	20	51	93	7	4 (5.6)	8 (11.3)	2 (2.2)	2 (2.2)	45	4 (9)	7 (15.6)
	P	4	1	2	1	0	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2	0	0
A + M	A	1,011	663	321	27	96	41 (4.1)	56 (5.5)			69	7 (10.1)	9 (13.0)
	M		504	143	364								
A + T	A	108	64	44	0	12	4 (3.7)	4 (3.7)			18	2 (11.1)	3 (16.7)
	T		1	4	103								
M + T	M	1,640	753	308	579	104	39 (2.4)	55 (3.4)			159	14 (8.8)	19 (11.9)
	T		7	56	1,577								
A + M + T	A	443	286	153	4	25	22 (5.0)	27 (6.1)			32	4 (12.5)	4 (12.5)
	M		256	83	104								
	T		2	8	433								
Others		38	15	8	15	1	3 (13.0)	3 (13.0)			14	1 (7.1)	1 (7.1)
Total		12,626	6,779	4,209	5,283	1,680	348 (3.2)	453 (4.1)	25 (0.5)	33 (0.6)	886	61 (6.9)	82 (9.3)

HD, Hospital deaths; (), mortality %

Number of redo cases is included in total case number of 12,626

(2) Ischemic heart disease (total, (A) + (B) + (C); 20,753)

(A) Isolated CABG (total, (a) + (b); 19,930)

(a) On-pump CABG (including planned on-pump beating-heart CABG at the time of incision) (total; 7,912)

in 2004

	Primary, elective			Primary, emergency			Redo, elective		
	Cases	Deaths	HD	Cases	Deaths	HD	Cases	Deaths	HD
1VD	176	3 (1.7)	5 (2.8)	42	5 (11.9)	6 (14.3)	23	0	1 (4.3)
2VD	1,166	13 (1.1)	18 (1.5)	181	9 (5.0)	12 (6.6)	41	2 (4.9)	3 (7.3)
3VD	3,481	46 (1.3)	64 (1.8)	490	36 (7.3)	59 (12.0)	70	2 (2.9)	2 (2.9)
LMT	1,532	12 (0.8)	21 (1.4)	627	60 (9.6)	68 (10.8)	29	1 (3.4)	1 (3.4)
Kawasaki	15	0	0	0	0	0	1	0	0
Total	6,370	74 (1.2)	108 (1.7)	1,340	110 (8.2)	145 (10.8)	164	5 (3.0)	7 (4.3)
Hemodialysis	308	8 (2.6)	21 (6.8)	85	11 (12.9)	15 (17.6)	6	0	0

	Redo, emergency			Artery graft only	Artery graft + SVG	SVG only	Others
	Cases	Deaths	HD				
1VD	5	1 (20.0)	1 (20.0)	162	27	51	6
2VD	10	1 (10.0)	2 (20.0)	612	708	76	2
3VD	11	2 (18.2)	3 (27.3)	1,051	2,874	126	1
LMT	12	3 (25.0)	4 (33.3)	660	1,400	137	3
Kawasaki	0	0	0	13	3	0	0
Total	38	7 (18.4)	10 (26.3)	2,498	5,013	390	12
Hemodialysis	1	0	0	77	292	30	1

HD, Hospital deaths; (), mortality %

LMT Includes LMT alone or LMT + other branch diseases

(b) Off-pump CABG (total; 12,018)

(The present section also includes cases of planned off-pump CABG in which, during surgery, the change is made to an on-pump CABG or on-pump beating-heart procedure) in 2004

	Primary, elective			Primary, emergency			Redo, elective		
	Cases	Deaths	HD	Cases	Deaths	HD	Cases	Deaths	HD
1VD	1,211	10 (0.8)	15 (1.2)	113	10 (8.8)	10 (8.8)	77	1 (1.3)	2 (2.6)
2VD	2,492	27 (1.1)	36 (1.4)	260	13 (5.0)	16 (6.2)	47	1 (2.1)	1 (2.1)
3VD	4,300	40 (0.9)	61 (1.4)	440	19 (4.3)	25 (5.7)	82	4 (4.9)	4 (4.9)
LMT	2,323	23 (1.0)	34 (1.5)	597	29 (4.9)	47 (7.9)	34	0	0
Kawasaki	9	0	0	1	0	0	1	0	0
Total	10,335	100 (1.0)	146 (1.4)	1,411	71 (5.0)	98 (6.9)	241	6 (2.5)	7 (2.9)
Hemodialysis	625	16 (2.6)	25 (4.0)	100	16 (16.0)	21 (21.0)	17	2 (11.8)	3 (17.6)

	Redo, emergency			Artery graft only	Artery graft + SVG	SVG only	Others
	Cases	Deaths	HD				
1VD	10	1 (10.0)	1 (10.0)	1,296	33	81	1
2VD	3	0	0	1,994	745	62	1
3VD	8	1 (12.5)	3 (37.5)	2,722	2,047	56	5
LMT	10	0	1 (10.0)	1,898	1,004	60	2
Kawasaki	0	0	0	11	0	0	0
Total	31	2 (6.5)	5 (16.1)	7,921	3,829	259	9
Hemodialysis	2	1 (50.0)	2 (100.0)	376	337	23	1

HD, Hospital deaths; (), mortality %

LMT Includes LMT alone or LMT + other branch diseases

(c) Includes cases of conversion, during surgery, from off-pump CABG to on-pump CABG or on-pump beating-heart CABG (Total; 318) in 2004

	Primary, elective			Primary, emergency			Redo, elective			Redo, emergency		
	Cases	Deaths	HD	Cases	Deaths	HD	Cases	Deaths	HD	Cases	Deaths	HD
A conversion in procedure to on-pump CABG	69	2 (2.9)	5 (7.2)	12	3 (25.0)	4 (33.3)	2	2 (100)	2 (100)	0	0	0
A conversion in procedure to on-pump beating-heart CABG	176	6 (3.4)	9 (5.1)	51	8 (15.7)	11 (21.6)	8	2 (25.0)	2 (25.0)	0	0	0
Total	245	8 (3.3)	14 (5.7)	63	11 (17.5)	15 (23.8)	10	4 (40.0)	4 (40.0)	0	0	0
Hemodialysis	11	1 (9.1)	4 (36.4)	4	1 (25.0)	3 (75.0)	2	2 (100)	2 (100)	0	0	0

HD, Hospital deaths; (), mortality %

(B) Operation for complications of MI (total; 823) in 2004

	Chronic			Acute			Concomitant operation		
	Cases	Deaths	HD	Cases	Deaths	HD	CABG	MVP	MVR
Infarctectomy or Aneurysmectomy	450	20 (4.4)	38 (8.4)	13	1 (7.7)	1 (7.7)	340	107	14
VSP closure	59	3 (5.1)	5 (8.5)	236	76 (32.2)	83 (35.2)	77	2	5
Cardiac rupture 1) papillary muscle rupture	3	0	0	25	5 (20.0)	7 (28.0)	8	1	14
2) ischemic	9	0	1 (11.1)	146	43 (29.5)	47 (32.2)	21	0	2
Mitral regurgitation	287	15 (5.2)	23 (8.0)	68	17 (25.0)	19 (27.9)	309	238	41
Others	15	0	1 (6.7)	10	3 (30.0)	3 (30.0)	10	2	0
Total	823	38 (4.6)	68 (8.3)	498	145 (29.1)	160 (32.1)	765	350	76

HD, Hospital deaths; (), mortality %

Acute, within 2 weeks from the onset of myocardial infarction

(C) TMLR (total; 0) in 2004

	Cases	Deaths	HD
Isolated	0	0	0
with CABG	0	0	0
Total	0	0	0

HD, Hospital deaths

(3) Operation for arrhythmia (total; 2,066) in 2004

	Cases	Deaths	HD	Concomitant operation			
				Isolated	Congenital	Valve	IHD
Maze	1,837	20 (1.1)	29 (1.6)	30	113	1,661	89
for WPW	7	0	0	3	0	3	1
for ventricular tachyarrhythmia	49	0	1 (2.0)	19	1	6	26
Others	173	2 (1.2)	2 (1.2)	119	8	39	7
Total	2,066	22 (1.1)	32 (1.5)	171	120	1,709	123

HD, Hospital deaths; (), mortality %

Except for 171 isolated cases, all remaining 1,895 cases are doubly allocated, one for this subgroup and the other for the subgroup corresponding to the concomitant operations

(4) Operation for constrictive pericarditis (total; 164) in 2004

	CPB (+)			CPB (-)		
	Cases	Deaths	HD	Cases	Deaths	HD
Total	67	7 (10.4)	8 (11.9)	97	7 (7.2)	8 (8.2)

HD, Hospital deaths; (), mortality %

(5) Cardiac tumor (total; 441) in 2004

	Cases	Deaths	HD	Concomitant operation			others
				AVR	MVR	CABG	
Myxoma	301	4 (1.3)	5 (1.7)	0	4	15	30
Others	140	8 (5.7)	9 (6.4)	5	9	7	14
Total	441	12 (2.7)	14 (3.2)	5	13	22	44

HD, Hospital deaths; (), mortality %

(6) HOCM and DCM (total; 99) in 2004

	Cases	Deaths	HD	Concomitant operation			
				AVR	MVR	MVP	GABG
Myectomy	29	2 (6.9)	4 (13.8)	13	7	3	3
Myotomy	6	1 (16.7)	1 (16.7)	1	0	4	0
No-resection	25	4 (16.0)	6 (24.0)	1	6	18	2
Volume reduction surgery of the left ventricle	39	6 (15.4)	8 (20.5)	5	9	27	7
Total	99	13 (13.1)	19 (19.2)	20	22	52	12

HD, Hospital deaths; (), mortality %

(7) Other open-heart operation (total; 370) in 2004

	Cases	Deaths	HD
Total	370	22 (5.9)	26 (7.0)

HD, Hospital deaths; (), mortality %

Table 3 Thoracic aortic aneurysm (total; 8,157)

(1) Dissecting (total, 3,858 = 2,642 + 143 + 626 + 447)

in 2004

Stanford type	Acute						Chronic					
	A			B			A			B		
Replaced site	Cases	Deaths	HD	Cases	Deaths	HD	Cases	Deaths	HD	Cases	Deaths	HD
Ascending	1,628	203 (12.5)	213 (13.1)	2	1 (50.0)	2 (100.0)	271	11 (4.1)	12 (4.4)	9	0	0
Ascending + Arch	930	158 (17.0)	169 (18.2)	14	1 (7.1)	1 (7.1)	218	9 (4.1)	12 (5.5)	19	3 (15.8)	4 (21.1)
Arch + Descending	33	7 (21.2)	7 (21.2)	15	4 (26.7)	5 (33.3)	14	1 (7.1)	1 (7.1)	52	3 (5.8)	4 (7.7)
Descending	14	1 (7.1)	1 (7.1)	50	11 (22.0)	12 (24.0)	67	4 (6.0)	5 (7.5)	167	9 (5.4)	11 (6.6)
Thoracoabdominal	1	0	0	10	2 (20.0)	2 (20.0)	38	6 (15.8)	6 (15.8)	108	21 (19.4)	22 (20.4)
Bypass	11	2 (18.2)	3 (27.3)	18	5 (27.8)	5 (27.8)	0	0	0	3	0	2 (66.7)
Stent graft**	25	2 (8.0)	2 (8.0)	34	0	1 (2.9)	18	2 (11.1)	2 (11.1)	89	1 (1.1)	2 (2.2)
1) transluminal* ^b	5	0	0	33	0	1 (3.0)	10	0	0	69	0	1 (1.4)
2) open stent a) with total arch* ^c	0	0	0	0	0	0	2	1 (50.0)	0	3	1 (33.3)	1 (33.3)
b) without total arch* ^d	20	2 (10.0)	2 (10.0)	1	0	0	6	1 (16.7)	2 (33.3)	17	0	0
Total	2642	373 (14.1)	395 (15.0)	143	24 (16.8)	28 (19.6)	626	33 (5.3)	38 (6.1)	447	37 (8.3)	45 (10.1)

Stanford type	Concomitant operation					Redo		
	AVP	AVR	MVP	MVR	CABG	Cases	Deaths	HD
Ascending	114	212	7	6	130	87	16 (18.4)	20 (23.0)
Ascending + Arch	81	92	2	1	49	45	7 (15.6)	8 (17.8)
Arch + Descending	2	1	0	0	3	8	1 (12.5)	1 (12.5)
Descending	0	2	0	0	5	23	1 (4.3)	1 (4.3)
Thoracoabdominal	0	0	0	0	1	28	6 (21.4)	6 (21.4)
Bypass	0	0	0	0	0	0	0	0
Stent graft**	1	0	0	0	2	5	0	0
1) transluminal* ^b	0	0	0	0	0	1	0	0
2) open stent a) with total arch* ^c	0	0	0	0	0	4	0	0
b) without total arch* ^d	1	0	0	0	2	0	0	0
Total	198	307	9	7	190	196	31 (15.8)	36 (18.4)

HD, Hospital deaths; (), mortality %

Acute, within 2 weeks from the onset

*a = *b + *c + *d

(2) Non-dissecting (total; 4,299 = 3,748 + 551)

in 2004

Replaced site	Unruptured			Ruptured			Concomitant operation				
	Cases	Deaths	HD	Cases	Deaths	HD	AVP	AVR	MVP	MVR	CABG
Ascending	1,049	32 (3.1)	38 (3.6)	37	5 (13.5)	8 (21.6)	100	717	31	26	109
Ascending + Arch	1,320	54 (4.1)	80 (6.1)	172	37 (21.5)	46 (26.7)	13	104	8	8	195
Arch + Descending	243	28 (11.5)	33 (13.6)	61	23 (37.7)	26 (42.6)	2	3	0	2	22
Descending	465	14 (3.0)	27 (5.8)	140	33 (23.6)	36 (25.7)	0	0	1	1	11
Thoracoabdominal	281	28 (10.0)	33 (11.7)	74	27 (36.5)	32 (43.2)	0	0	0	0	2
Bypass	15	1 (6.7)	1 (6.7)	2	1 (50.0)	1 (50.0)	0	0	0	0	0
Stent graft* ^a	375	10 (2.7)	19 (5.1)	65	5 (7.7)	15 (23.1)	0	4	0	0	5
1) transluminal* ^b	278	5 (1.8)	11 (4.0)	54	3 (5.6)	11 (20.4)	0	0	0	0	0
2) open stent a) with total arch* ^c	16	1 (6.3)	2 (12.5)	1	1 (100)	1 (100)	0	1	0	0	3
b) without total arch* ^d	81	4 (4.9)	6 (7.4)	10	1 (10.0)	3 (30.0)	0	3	0	0	2
Total	3,748	167 (4.5)	231 (6.2)	551	131 (23.8)	164 (29.8)	115	828	40	37	344

Replaced site	Redo			CPB (-)		
	Cases	Deaths	HD	Cases	Deaths	HD
Ascending	101	11 (10.9)	15 (14.9)	0	0	0
Ascending + Arch	62	12 (19.4)	15 (24.2)	3	0	0
Arch + Descending	12	1 (8.3)	3 (25.0)	1	0	0
Descending	28	4 (14.3)	5 (17.9)	3	0	0
Thoracoabdominal	17	7 (41.2)	7 (41.2)	24	1 (4.2)	1 (4.2)
Bypass	1	0	0	12	2 (16.7)	2 (16.7)
Stent graft* ^a	38	2 (5.3)	3 (7.9)	123	0	5 (4.1)
1) transluminal* ^b	30	0	1 (3.3)	123	0	5 (4.1)
2) open stent a) with total arch* ^c	1	1 (100)	1 (100)	0	0	0
b) without total arch* ^d	7	1 (14.3)	1 (14.3)	0	0	0
Total	259	37 (14.3)	48 (18.5)	166	3 (1.8)	8 (4.8)

HD, Hospital deaths; (), mortality %

*a = *b + *c + *d

Table 4 Pulmonary thromboembolism (total; 103) in 2004

	Cases	Deaths	HD
Acute	60	12 (20.0)	12 (20.0)
Chronic	43	2 (4.7)	2 (4.7)
Total	103	14 (13.6)	14 (13.6)

HD, Hospital deaths; (), mortality %

Table 5 Assist circulation (total; 1,520) in 2004

	Sites	VAD								
		Device			Results					
		Centrifugal	VAS	Others	Not weaned			Weaned		
On going	Deaths				Transplant	On going	Deaths	Transplant		
Post cardiotomy	Left	21	8	0	1	12 (41.4)	0	10	4 (13.8)	0
	Right	4	0	0	0	2 (50.0)	0	0	2 (50.0)	0
	Biventricle Right	4	0	0	0	3 (75.0)	0	1	0 (25.0)	0
	Left	3	1	0						
Congestive heart failure	Left	14	51	0	26	20 (30.8)	2	13	3 (4.6)	1
	Right	0	1	0	0	1 (100.0)	0	0	0	0
	Biventricle Right	9	4	1	4	8 (57.1)	0	0	2 (14.3)	0
	Left	0	13	1						
Respiratory failure										
Total		55	78	2	31	46 (34.1)	2	24	11 (8.1)	1

	Sites	Heart-Lung assist					
		Method		Results			
		PCPS	Others	Not weaned		Weaned	
Deaths	Transplant			Deaths	Transplant		
Post cardiotomy	Left	516	72	335 (57.0)	0	88 (15.0)	165
	Right						
	Biventricle Right						
	Left						
Congestive heart failure	Left	679	28	350 (49.5)	0	95 (13.4)	262
	Right						
	Biventricle Right						
	Left						
Respiratory failure		72	18	38 (42.2)	1	11 (12.2)	40
Total		1,267	118	723 (52.2)	1	194 (14.0)	467

HD, Hospital deaths; (), mortality %

Table 6 Heart transplantation (total; 5) in 2004

	Cases	Deaths	HD
Heart transplantation	5	0	1
Heart and lung transplantation	0	0	0
Total	5	0	1

HD, Hospital deaths

Table 7 Pacemaker + ICD (total; 15,327) in 2004

	Pacemaker		ICD
	Univent	Bivent	
Initial	7,509	1,422	1,002
Exchange	4,644	607	143
Total	12,153	2,029	1,145

(B) General thoracic surgery

A 91% return rate for the questionnaires is not satisfactory, although the figures collected certainly serve as guidelines when evaluating the current activity and tendencies in a variety of aspects of our service. Close to three-fourths of the hospitals returning the questionnaires treated fewer than 100 thoracic cases per year. The overall volume of surgery performed in our country keeps increasing and is approaching 50,000 per year, being pushed up apparently by the steadily increasing number of surgical procedures for primary lung cancer, which now comprise 45% of the total. Other surgeries, however, also keep increasing in number. The volume has almost doubled during the last 10 years. Video-assisted thoracoscopic surgery (VATS) has been carried out in 66.6% of patients with benign pulmonary tumors, in 63.8% of those with wedge resection for primary lung cancer, and in 32.8% of those with lobectomy for primary lung cancer. Regardless of the approach, the hospital mortality is reported to be 0.8% for lobectomy for primary lung cancer. This is not an average number of mortalities of each responding hospital but an overall one, and it is comparable to the figures reported from many other countries.

Tumors of colorectal origin comprise 47.2% of those operated on for metastatic pulmonary tumors. Those of renal origin were in the second place. The low mortality rate of 1.5% after tracheal surgery deserves our attention despite the small number of cases in this category. When we look at mesothelioma, one may wonder how VATS manages to overcome the difficulties posed by the diffuse nature of this disease. We do not have the answer and so must study the question in the future. Volume reduction surgery for emphysema was done in only 46 cases, with

comparatively low mortality (4.3%). Whether this is due to adherence to strict indications or simply to the paucity of patients who want to undergo surgery is not clear, but the mortality seems acceptable so far.

Pneumothorax is the second largest group of diseases subjected to surgery in our service, the total number of which exceeded 10,000 in 2004. We must pay attention to the mortality of 0.1% (12/9,448) in patients with primary spontaneous pneumothorax, as it should be zero. Lung transplantation has been done in 15 patients, 8 of whom succumbed to hospital death, resulting in a mortality of 53.3%. Along with donor shortage, this high mortality might prevent this practice from developing further, although professionally we have to work on reversing these numbers.

VATS, in general, has been carried out in close to 50% of general thoracic surgery cases, with seemingly tolerable mortality of 0.2%. Tracheobronchoplasty, a complex procedure, was carried out in 582 cases with a mortality of 1.4%. If we limit it to lung cancer surgery, 451 of 22,229 (2.0%) patients were subjected to this procedure with 2.3% of mortality. Either of these mortality figures sounds reasonable in light of the worldwide average. The decreasing rate of bronchoplastic procedures and reciprocally increasing rate of VATS procedures for primary lung cancer surgery reflect the rapid increase in adenocarcinoma. The squamous cell cancer/adenocarcinoma ratio is roughly 1:3 in this report. It should be mentioned that neither the number of patients operated on for squamous cell carcinoma nor the number of those who underwent the bronchoplastic procedure has been decreasing.

Now that our annual survey has provided us with these valuable data, we must take a look at the mortality and patient volume per hospital.

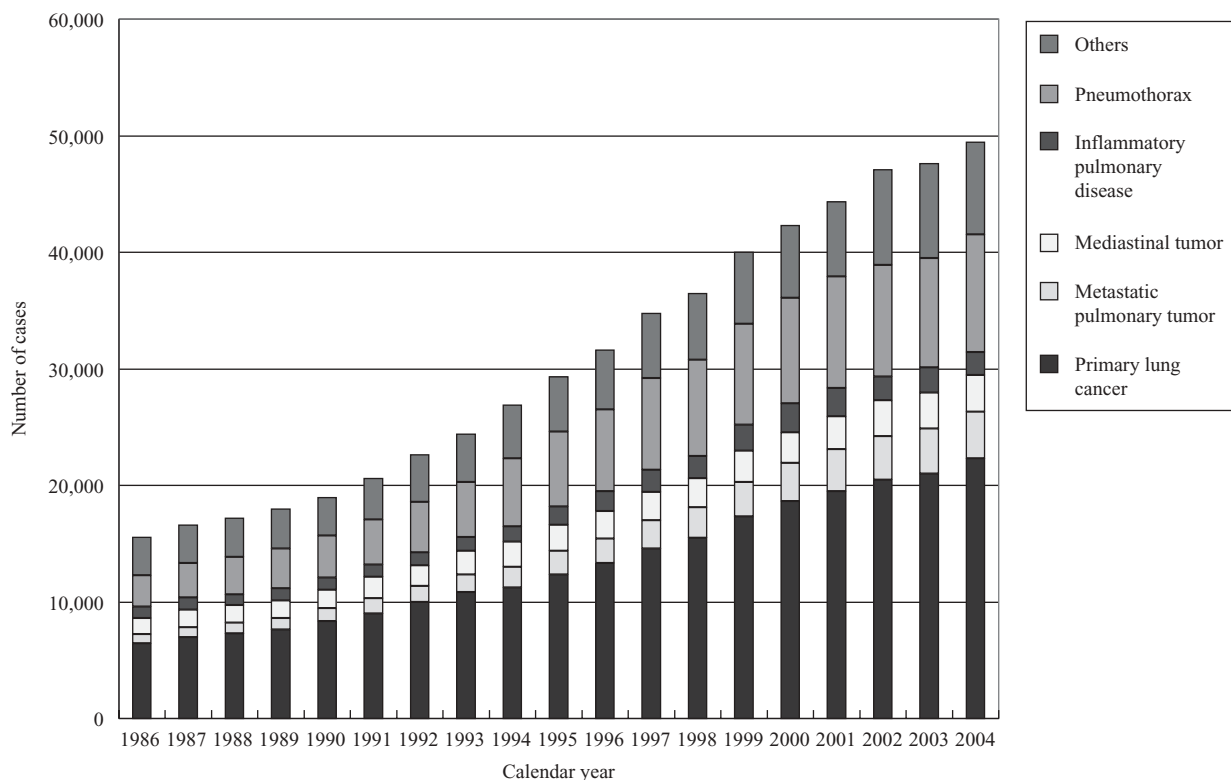


Fig. 1 General thoracic surgery

Table 1 Total entry cases of general thoracic surgery during 2004 in 2004

	Cases	%
Benign pulmonary tumor	1,003	2.0
Non-neoplastic benign disease	1,612	3.3
Primary lung cancer	22,229	45.0
Other primary malignant pulmonary tumor	384	0.8
Metastatic pulmonary tumor	3,985	8.1
Tracheal tumor	66	0.1
Mesothelioma	247	0.5
Chest wall tumor	625	1.3
Mediastinal tumor	3,149	6.4
Thymectomy without thymoma for MG	604	1.2
Inflammatory pulmonary disease	2,009	4.1
Empyema	1,170	2.4
Bullous disease excluding pneumothorax	698	1.4
Pneumothorax	10,047	20.4
Chest wall deformity	311	0.6
Diaphragmatic hernia including traumatic	153	0.3
Chest trauma excluding diaphragmatic hernia	362	0.7
Lung transplantation	15	0.0
Others	699	1.4
Total	49,368	100.0

Table 2

in 2004

	Cases	30-day deaths	%	HD	%	By VATS
1. Benign pulmonary tumor	1,003	0	0.0	0	0.0	668
Hamartoma	432	0	0.0	0	0.0	310
Others	571	0	0.0	0	0.0	358

HD, Hospital deaths

Table 3

in 2004

	Cases	30-day deaths	%	HD	%
2. Non-neoplastic benign disease	1,612	2	0.1	2	0.1

HD, Hospital deaths

Table 4

in 2004

	Cases	30-day deaths	%	HD	%	By VATS
3. Primary malignant pulmonary tumor	22,447	180	0.8	213	0.9	
Lung cancer	22,229	178	0.8	211	0.9	
Adenocarcinoma	14,741	75	0.5	88	0.6	
Squamous cell carcinoma	5,161	78	1.5	95	1.8	
Large cell carcinoma (LCNEC)	655 (167)	5 (2)	0.8 1.2	6 (2)	0.9 1.2	
Small cell carcinoma	443	4	0.9	5	1.1	
Adenosquamous carcinoma	347	3	0.9	3	0.9	
Carcinoid	127	0	0.0	0	0.0	
Adenoid cystic carcinoma	21	0	0.0	0	0.0	
Mucoepidermoid carcinoma	35	1	2.9	2	5.7	
Carcinosarcoma	43	3	7.0	3	7.0	
Unclassified	150	4	2.7	5	3.3	
Multiple lung cancer	339	3	0.9	2	0.6	
Wedge resection	2,377	9	0.4	10	0.4	1,517
Segmental excision	1,461	6	0.4	6	0.4	623
Sleeve segmental excision	49	0	0.0	0	0.0	44
Lobectomy	16,784	121	0.7	142	0.8	5,510
Sleeve lobectomy	392	9	2.3	9	2.3	36
Pneumonectomy	640	26	4.1	32	5.0	20
Sleeve pneumonectomy	10	0	0.0	0	0.0	0
Pleuropneumonectomy	22	2	9.1	1	4.5	1
Others	328	3	0.9	3	0.9	69
Sarcoma	32	0	0.0	0	0.0	
AAH	166	0	0.0	0	0.0	
Others	186	2	1.1	2	1.1	

HD, Hospital deaths

Table 5

in 2004

	Cases	30-day deaths	%	HD	%	By VATS
4. Metastatic pulmonary tumor	3,985	16	0.4	20	0.5	2,171
Colo-rectal	1,882	6	0.3	8	0.4	1,030
Hepatobiliary/Pancreatic	165	0	0.0	0	0.0	93
Uterine	159	0	0.0	0	0.0	94
Mammary	267	0	0.0	0	0.0	167
Ovarian	30	0	0.0	0	0.0	14
Testicular	68	0	0.0	0	0.0	43
Renal	343	1	0.3	1	0.3	188
Skeletal	103	1	1.0	0	0.0	51
Soft tissue	171	1	0.6	1	0.6	74
Otorhinolaryngological	214	2	0.9	4	1.9	126
Pulmonary	214	2	0.9	2	0.9	95
Others	369	3	0.8	4	1.1	196

HD, Hospital deaths

Table 6

in 2004

	Cases	30-day deaths	%	HD	%
5. Tracheal tumor	66	1	1.5	1	1.5

HD, Hospital deaths

Table 7

in 2004

	Cases	30-day deaths	%	HD	%	By VATS
6. Mesothelioma	247	8	3.2	9	3.6	104
Localized	74	0	0.0	0	0.0	47
Diffuse	173	8	4.6	9	5.2	57

HD, Hospital deaths

Table 8

in 2004

	Cases	30-day deaths	%	HD	%
7. Chest wall tumor	625	0	0.0	0	0.0

HD, Hospital deaths

Table 9

in 2004

	Cases	30-day deaths	%	HD	%	By VATS
8. Mediastinal tumor	3,149	17	0.5	17	0.5	1,160
Thymoma	1,244	4	0.3	4	0.3	218
Thymic cancer	168	1	0.6	1	0.6	8
Germ cell tumor	213	1	0.5	1	0.5	51
Benign	149	0	0.0	0	0.0	48
Malignant	64	1	1.6	1	1.6	3
Neurogenic tumor	421	1	0.2	1	0.2	289
Congenital cyst	507	1	0.2	1	0.2	341
Goiter	90	1	1.1	1	1.1	5
Lymphatic tumor	185	5	2.7	5	2.7	96
Others	321	3	0.9	3	0.9	101

HD, Hospital deaths

Table 10

in 2004

	Cases	30-day deaths	%	HD	%
9. Thymectomy for myasthenia gravis	604	2	0.3	3	0.5
Of them, with thymoma	279	2	0.7	2	0.7

HD, Hospital deaths

Table 11

in 2004

	Cases	30-day deaths	%	HD	%	By VATS
10. Inflammatory pulmonary disease	2,009	4	0.2	5	0.2	1,202
Tuberculous infection	629	2	0.3	2	0.3	405
Fungal infection	272	1	0.4	1	0.4	113
Bronchiectasis	82	1	1.2	2	2.4	25
Others	1,026	0	0.0	0	0.0	659

HD, Hospital deaths

Table 12

in 2004

	Cases	30-day deaths	%	HD	%	Radical surgery
11. Empyema	1,170	40	3.4	52	4.4	764

HD, Hospital deaths

Table 13

in 2004

	Cases	30-day deaths	%	HD	%	By VATS
12. Bullous disease	698	5	0.7	5	0.7	453
Emphysematous bulla	542	3	0.6	3	0.6	359
Bronchogenic cyst	80	0	0.0	0	0.0	53
Emphysema with volume reduction surgery	46	2	4.3	2	4.3	31
Others	30	0	0.0	0	0.0	10

HD, Hospital deaths

Table 14

in 2004

	Cases	30-day deaths	%	HD	%	By VATS
13. Pneumothorax	10,047	21	0.2	23	0.2	8,879
Primary spontaneous	9,448	10	0.1	12	0.1	8,477
Secondary	599	11	1.8	11	1.8	402

HD, Hospital deaths

Table 15

in 2004

	Cases	30-day deaths	%	HD	%
14. Chest wall deformity	311	0	0.0	0	0.0
Funnel chest	250	0	0.0	0	0.0
Others	61	0	0.0	0	0.0

HD, Hospital deaths

Table 16

in 2004

	Cases	30-day deaths	%	HD	%	Traumatic
15. Diaphragmatic hernia	153	10	6.5	11	7.2	48

HD, Hospital deaths

Table 17

in 2004

	Cases	30-day deaths	%	HD	%
16. Chest trauma	362	29	8.0	34	9.4

HD, Hospital deaths

Table 18

in 2004

	Cases	30-day deaths	%	HD	%
17. Other respiratory surgery	637	6	0.9	6	0.9
Arteriovenous malformation*	89	0	0.0	0	0.0
Pulmonary sequestration	104	0	0.0	0	0.0
Others	444	6	1.4	6	1.4

HD, Hospital deaths

*In addition, 9 more cases treated by embolization

Table 19

in 2004

	Cases	30-day deaths	%	HD	%
18. Lung transplantation	15	5	33.3	8	53.3

HD, Hospital deaths

Table 20

in 2004

	Cases	30-day deaths	%	HD	%
19. Video-assisted thoracic surgery	24,479	43	0.2	49	0.2

HD, Hospital deaths

Table 21

in 2004

	Cases	30-day deaths	%	HD	%
20. Tracheobronchoplasty	582	6	1.0	6	1.0
Trachea	58	0	0.0	0	0.0
Carinal reconstruction	7	0	0.0	0	0.0
Sleeve pneumonectomy	71	1	1.4	1	1.4
Bronchus	390	5	1.3	5	1.3
Others	56	0	0.0	0	0.0

HD, Hospital deaths

Table 22

in 2004

	Cases	30-day deaths	%	HD	%
21. Pediatric surgery	618	8	1.3	10	1.6

HD, Hospital deaths

(C) Esophageal Surgery

During 2004 alone, a total of 13,819 patients with esophageal disease were registered from 581 institutions affiliated with the Japanese Association for Thoracic Surgery and/or the Japan Esophageal Society. Among these institutions, there were 114 (19.6%) hospitals where 25 or more patients underwent esophageal surgery. Of 5,488 patients with a benign esophageal disease, 873 (15.9%) underwent surgery, and 55 (1.0%) underwent endoscopic resection; 4,560 (83.1%) patients did not undergo any surgical treatment. Of 8,331 patients with a malignant esophageal tumor, 5,676 (68.1%) patients underwent surgery: esophagectomy in 4,739 (56.9%) and endoscopic mucosal resection (EMR) in 937 (11.2%). The other 2,655 (31.9%) patients did not undergo any surgery. The patients registered, particularly those receiving non-surgical therapy for a malignant esophageal disease, have been increasing since 1990 (Fig. 1).

Among the benign esophageal diseases (Table 1), esophageal varices, reflux esophagitis, and hiatal hernia were the most common. Achalasia, benign esophageal tumors, spontaneous esophageal rupture, and congenital esophageal atresia, as well as the above-mentioned diseases, were the most common diseases that were treated surgically. Thoracoscopic and/or laparoscopic procedures have been widely adopted for benign esophageal diseases (in particular achalasia, hiatal hernia, esophageal varices, and benign tumors). Open surgery was performed in 574 patients with a benign esophageal disease, with 30-day mortality occurring in 11 (1.9%) and hospital mortality including 30-day mortality in 29 (5.1%). Thoracoscopic and/or laparoscopic surgery was performed in 299 patients, with a 0.7% 30-day mortality and hospital mortality rate. Altogether, 55 patients underwent endoscopic resection of a benign esophageal tumor without mortality.

Most of the malignant diseases were carcinomas (Table 2). Among the esophageal malignancies, the incidence of squamous cell carcinoma was 95.6%, and that of adenocarcinoma in Barrett's esophagus was 1.6%. The resection rate for patients with a squamous cell carcinoma was 67.4%, and that for patients with an adenocarcinoma in Barrett's esophagus was 93.1%.

According to location, cancer in the thoracic esophagus was most common (Table 3). Superficial esophageal cancer, including mucosal and submucosal cancers, was observed in 2,166 (26.0%) patients, and advanced esophageal cancer invading deeper than the submucosal

layer was observed in 6,165 (74.0%). Of the patients with a superficial esophageal cancer, 1,010 (46.6%) underwent esophagectomy, and 937 (43.3%) underwent EMR; 219 (10.1%) patients received nonsurgical treatment. The 30-day mortality and hospital mortality rates after esophagectomy for patients with a superficial cancer were 0.7% and 1.5%, respectively. No patient died after EMR. Of the 6,165 patients with an advanced esophageal cancer, 3,729 (60.5%) underwent esophagectomy, with a 1.5% 30-day mortality rate and 4.9% hospital mortality rate.

A double primary cancer was observed in 965 (11.6%) of all 8,331 patients with an esophageal cancer. Synchronous cancer was found in 569 (6.8%) patients, and metachronous cancer was found in 396 (4.8%). A double primary cancer in the stomach was synchronously observed in 265 (3.2%) patients, and that in the head and neck was observed in 166 (2.0%) patients (Table 3).

Among esophagectomy procedures, transthoracic esophagectomy through a right thoracotomy was the most common approach for patients with a superficial cancer or an advanced cancer (Table 4). Transhiatal esophagectomy, commonly performed in Western countries, was employed in only 6.9% of patients with a superficial cancer who underwent esophagectomy and in 2.3% of those with an advanced cancer. Thoracoscopic or laparoscopic esophagectomy (or both) were employed in 167 patients (16.5%) with a superficial cancer and in 319 patients (8.6%) with an advanced cancer.

Combined resection of the neighboring organs during resection of an esophageal cancer was performed in 196 patients (Table 4). Resection of the aorta together with the esophagectomy was performed in two patients without mortality. Tracheal or bronchial resection (or both) combined with esophagectomy was performed in 17 patients, with no 30-day mortality but with hospital mortality in 2 (11.8%). Lung resection combined with esophagectomy was performed in 59 patients, with a 30-day mortality rate of 8.5% and a hospital mortality rate of 18.6%. The 30-day mortality rate was 3% during the period from 1996 (when the registration started) to 1999, and 2% from 1999 to 2001. The 30-day mortality rates have decreased to 1% since 2002 (Table 5). The average 30-day mortality rates after combined resection of the neighboring organs during the most recent 9 years were 16% for the aorta, 6% for the tracheobronchus, 2% for the lung, and 2% for the other organs.

Salvage surgery after definitive (chemo)radiotherapy was performed in 129 patients, with the 30-day mortality rate at 1.6% and the hospital mortality rate at 11.6%.

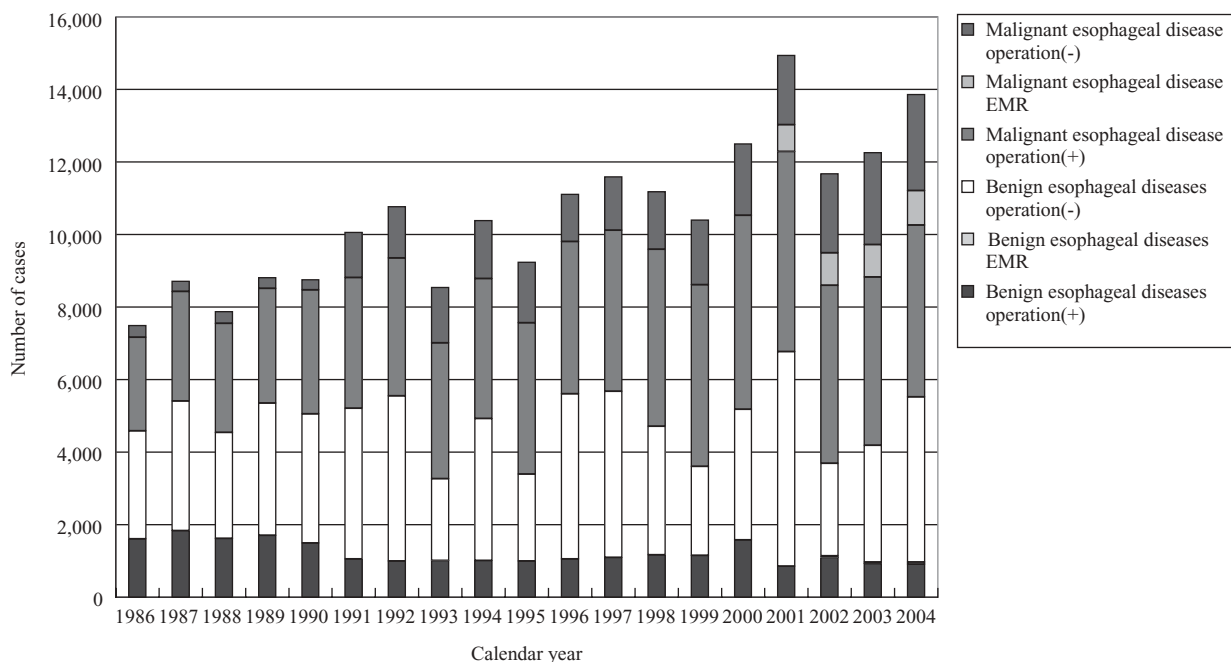


Fig. 1 Esophageal surgery

Table 1 Benign esophageal diseases in 2004

	Operation(+)									Endoscopic resection	Operation(-)	Total
	Total Cases	Open Surgery	T/L	Direct Deaths			Hospital Deaths					
				Total	Open Surg.	T/L	Total	Open Surg.	T/L			
1. Achalasia	94	40	54	0	0	0	0	0	0	–	53	147
2. Benign tumor	70	36	34	0	0	0	0	0	0	55	35	160
(1) Leiomyoma	44	19	25	0	0	0	0	0	0	17	27	88
(2) Cyst	6	3	3	0	0	0	0	0	0	1	4	11
(3) Others	20	14	6	0	0	0	0	0	0	37	4	61
3. Diverticulum	20	17	3	0	0	0	0	0	0	–	91	111
4. Hiatal hernia	232	128	104	0	0	0	1	1	0	–	1,199	1,431
5. Spontaneous rupture of the esophagus	66	64	2	2	2	0	10	10	0	–	12	78
6. Esophageal perforation	58	56	2	5	5	0	8	8	0	–	19	77
7. Esophago-tracheal fistula	19	19	0	0	0	0	1	1	0	–	32	51
8. Congenital esophageal atresia	56	51	5	3	3	0	7	7	0	–	9	65
9. Congenital esophageal stenosis	6	6	0	0	0	0	0	0	0	–	18	24
10. Corrosive stricture of the esophagus	7	7	0	0	0	0	0	0	0	–	9	16
11. Esophagitis, Esophageal ulcer	40	23	17	0	0	0	0	0	0	–	1,560	1,600
12. Esophageal varices	179	102	77	3	1	2	3	1	2	–	1,449	1,628
(1) Laparotomy	35	34	1	1	1	0	1	1	0	–	–	35
(2) Others	144	68	76	2	0	2	2	0	2	–	710	854
(3) Sclerotherapy	–	–	–	–	–	–	–	–	–	–	739	739
13. Others	26	25	1	0	0	0	1	1	0	–	74	100
Total	873	574	299	13	11	2	31	29	2	55	4,560	5,488

Direct deaths, death within 30 days; Hospital deaths, death during hospitalization; T/L, thoracoscopic and/or laparoscopic surgery

Table 2 Malignant esophageal diseases (histologic classification)

in 2004

	Operation(+)	Operation(-)	Total
Carcinomas	5,608	2,652	8,260
1. Squamous cell carcinoma	5,319	2,577	7,896
2. Adenocarcinoma in the Barrett's esophagus	121	9	130
3. Other adenocarcinoma	94	21	115
4. Adenosquamous carcinoma	17	4	21
5. Adenoid cystic carcinoma	1	0	1
6. Basaloid(-squamous)carcinoma	33	11	44
7. Small cell carcinoma	7	6	13
8. Undifferentiated carcinoma(no-small cell type)	13	22	35
9. Others	3	2	5
Other malignancies	55	10	65
1. Malignant non-epithelial tumors	15	5	20
2. Carcinosarcoma	24	3	27
3. Malignant melanoma	13	2	15
4. Other malignant tumors	3	0	3
Total	5,663	2,662	8,325

Table 3 Malignant esophageal disease

in 2004

	Operation(+)			EMR	Operation(-)	Total
	Cases	Direct Deaths	Hospital Deaths			
1. Esophageal cancer	4,739	64	199	937	2,655	8,331
Location						
(1) Cervical esophagus	202	4	9	21	202	404
(2) Thoracic esophagus	3,994	52	173	811	2,224	6,218
(3) Abdominal esophagus	352	6	10	39	137	489
(4) Multiple cancers	189	2	7	66	92	281
(5) Others/not described	2	0	0	0	0	2
Stage						
(1) Superficial cancer	1,010	7	15	937	219	2,166
(2) Advanced cancer	3,729	57	184	0	2,436	6,165
2. Multiple primary cancers	675	10	26	–	290	965
1) Synchronous	402	6	17	–	167	569
(1) Head & neck	114	0	3	–	52	166
(2) Stomach	203	6	11	–	62	265
(3) Others	85	0	3	–	53	138
2) Metachronous	273	4	9	–	123	396
(1) Head & neck	69	1	3	–	28	97
(2) Stomach	123	2	3	–	45	168
(3) Others	81	1	3	–	50	131

Table 4 Malignant Esophageal disease (surgical procedures)

in 2004

	Cases	Direct deaths	Hospital deaths
1. Surgical procedures			
Superficial cancer	1,947	7	15
1) Endoscopic mucosal resection	937	0	0
2) Esophagectomy	1,010	7	15
(1) Transhiatal esophagectomy	70	0	0
(2) Thoracoscopic and/or laparoscopic procedure	167	2	4
(3) Transthoracic (rt.) esophagectomy and reconstruction	710	4	10
(4) Transthoracic (lt.) esophagectomy and reconstruction	25	0	0
(5) Cervical esophageal resection and reconstruction	7	0	0
(6) Two stage operation	2	0	0
(7) Others / not described	29	1	1
Advanced cancer	3,729	57	184
1) Endoscopic mucosal resection	0	0	0
2) Esophagectomy	3,729	57	184
(1) Transhiatal esophagectomy	87	0	4
(2) Thoracoscopic and/or laparoscopic procedure	319	3	18
(3) Transthoracic (rt.) esophagectomy and reconstruction	2,886	44	137
(4) Transthoracic (lt.) esophagectomy and reconstruction	182	2	9
(5) Cervical esophageal resection and reconstruction	109	2	4
(6) Two stage operation	50	2	8
(7) Others / not described	96	4	4
2. Combined resection of other organs	196	7	19
(1) Aorta	2	0	0
(2) Trachea, Bronchus	17	0	2
(3) Lung	59	5	11
(4) Others	119	2	6
3. Salvage Surgery	129	2	15

Table 5 Mortality after combined resection of the neighbouring organs

in 2004

	Esophagectomy	Combinede resection			
		Aorta	Tracheobronchus	Lung	Others
1996	4,194 (3%)	7 (43%)	24 (0%)	50 (4%)	78 (5%)
1997	4,441 (3)	1 (0)	34 (15)	56 (2)	94 (3)
1998	4,878 (3)	4 (0)	29 (0)	74 (1)	128 (2)
1999	5,015 (2)	5 (0)	23 (9)	68 (0)	122 (1)
2000	5,350 (2)	2 (0)	23 (9)	69 (0)	96 (1)
2001	5,521 (2)	1 (0)	26 (4)	83 (4)	99 (2)
2002	4,904 (1)	3 (33)	20 (10)	63 (0)	63 (2)
2003	4,639 (1)	0	24 (10)	58 (0)	88 (1)
2004	4,739 (1)	2 (0)	17 (0)	59 (8)	119 (2)
Total	43,681 (2%)	25 (16%)	220 (6%)	580 (2%)	890 (2%)

(%): Mortality within 30 days

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Reference

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Corrections

In some sections of the following tables published in previous annual reports, the data were incorrect. The corrected data, indicated by underlining, are as follows:

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Table II. Acquired (total, (1) + (2) + (4) + (5) + (6) + (7) + isolated operation for arrhythmia in (3); 32,586

(1) Valvular heart disease (total; 10,505) in 2001

	Valve	Cases	Replace	
			Deaths	HD
Isolated	A	4,455	118 (<u>2.7</u>)	140 (<u>3.2</u>)
	M	3,312	54 (<u>2.8</u>)	71 (<u>3.7</u>)
	T	175	4 (<u>5.5</u>)	7 (<u>9.6</u>)
	P	11	0 (<u>0</u>)	0 (<u>0</u>)
A + M	A	864	40 (4.6)	50 (5.8)
	M			
A + T	A	60	3 (5.0)	4 (6.7)
	T			
M + T	M	1,343	40 (3.0)	47 (3.5)
	T			
A + M + T	A	347	17 (4.9)	21 (6.1)
	M			
	T			
Others		37	7 (<u>28.0</u>)	9 (<u>36.0</u>)
Total		10,505	283 (<u>2.9</u>)	349 (<u>3.6</u>)

HD, Hospital deaths; (), mortality %
 Number of redo cases is included in total case number of 10,505

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Table II. Acquired (total, (1) + (2) + (4) + (5) + (6) + (7) + isolated operation for arrhythmia in (3); 35,399

(1) Valvular heart disease (total; 11,552) in 2002

	Valve	Cases	Replace	
			Deaths	HD
Isolated	A	4,778	143 (3.0)	182 (3.8)
	M	3,626	77 (3.7)	103 (2.8)
	T	172	4 (4.8)	7 (4.1)
	P	4	1 (0)	1
A + M	A	943	50	64 (6.8)
	M			
A + T	A	103	8 (7.8)	9 (8.7)
	T			
M + T	M	1,488	46 (3.1)	66 (4.4)
	T			
A + M + T	A	404	21 (5.2)	26 (6.4)
	M			
	T			
Others		34	6 (23.1)	6 (17.6)
Total		11,552	355 (3.4)	464 (4.0)

HD, Hospital deaths; (), mortality %

Number of redo cases is included in total case number of 10,505

Vol. 53 no. 9 p. 522

Table II. Acquired (total, (1) + (2) + (4) + (5) + (6) + (7) + isolated operation for arrhythmia in (3); 35,164

(1) Valvular heart disease (total; 11,837) in 2003

	Valve	Cases	Replace	
			Deaths	HD
Isolated	A	5,013	133 (2.7)	157 (3.2)
	M	3,700	78 (4.0)	100 (5.1)
	T	151	5 (8.1)	8 (12.9)
	P	2	0	0
A + M	A	888	43 (4.8)	51 (5.9)
	M			
A + T	A	98	3 (3.1)	7 (7.4)
	T			
M + T	M	1,536	40 (2.6)	60 (5.5)
	T			
A + M + T	A	409	16 (3.9)	22 (5.5)
	M			
	T			
Others		40	3 (13.0)	3 (13.0)
Total		11,837	321 (3.1)	408 (3.9)

HD, Hospital deaths; (), mortality %

Number of redo cases is included in total case number of 11,837