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Annual Report

Vascular Surgery in Japan: 2012 Annual Report by the Japanese Society for Vascular Surgery

The Japanese Society for Vascular Surgery Database Management Committee Member, NCD Vascular Surgery Data Analysis Team

Objectives: This is an annual report indicating the number and early clinical results of annual vascular treatments performed by vascular surgeons in Japan in 2012, as analyzed by database management committee (DBC) members of the JSVS.

Materials and Methods: To survey the current status of vascular treatments performed by vascular surgeons in Japan, the DBC members of the JSVS analyzed the vascular treatment data provided by the NCD vascular surgery data analysis team, including the number of treatments and early clinical results such as operative and in-hospital mortality.

Results: In total 95,979 vascular treatments were registered by 1,043 institutions in 2012. This database is composed of 7 fields including treatment of aneurysms, chronic arterial occlusive disease, acute arterial occlusive disease, vascular injury, complication of previous vascular reconstruction, venous diseases, and other vascular treatments. The number of vascular treatments in each field was 19,600, 13,141, 4,600, 1,623, 1,973, 30,725, and 24,332, respectively. In the field of aneurysm treatment, 15,745 cases with abdominal aortic aneurysms (AAA) including common iliac aneurysms were registered, and 47.6% were treated by stent graft. Among AAA cases, 1,704 (10.8%) cases were registered as ruptured AAA. The operative mortality of ruptured and non-ruptured AAA was 17.8%, and 0.8%, respectively. Regarding chronic arterial occlusive disease, open repair was performed in 7,859 cases, including 1,173 distal bypasses to the crural or pedal artery, whereas endovascular procedures were performed in 5,282 cases. Venous treatment including 30,088 cases with varicose vein treatments and 395 cases with lower limb deep venous thrombosis were registered. Regarding other vascular operations, 22,654 cases of vascular access operations and 1,390 amputation surgeries were included. The number of lower limb amputations was still increasing and the mortality rate of amputation surgery was also still high; both of these issues require improvement.

Conclusions: The number of vascular treatments increased since 2011, and the proportion of endovascular procedures increased in almost all fields of vascular diseases, especially endovascular aneurysm repair (EVAR) for aneurysms and endovenous laser ablation (EVLA) for varicose veins. (This is a translation of Jpn J Vasc Surg 2018; 27: 437–456.)

Keywords: peripheral arterial disease, aneurysm, stent graft, endovascular treatment, varicose vein

Introduction

In 2011, The National Clinical Database (NCD) was founded and registration of surgical cases was started in 2011. Based on the cases registered by the NCD, the Japanese Society for Vascular Surgery (JSVS) has summarized the data pertaining to vascular surgery and has published the respective results in the form of annual reports. In this report, we describe the results obtained following the summary and analysis of vascular surgery cases registered in the NCD between January and December 2012. The summary and analysis were performed by members of the JSVS Database Management Committee.

Methods

Data pertaining to vascular surgery were extracted by NCD vascular surgery data analysis team under the request of JSVS. Results were summarized, checked, and analyzed by the members of JSVS Database Management Committee. NCD-registered treatments performed during 2012 were categorized into the following seven categories: 1) treatment for aneurysms, 2) revascularization for chronic arterial occlusion, 3) revascularization for acute arterial occlusion, 4) treatment for vascular trauma, 5) treatment for vascular complications after revascularization, 6) venous surgery, and 7) other vascular disease and related surgery. The cases in each category were summa-

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Table 1 New items or changes in 2012 annual report

New items	Table number	Status until 2011
Coil embolism	Table 2-3	Not existed
Laser ablation (± sclerotherapy)	Table 7-1	Not existed
Valve plasty	Table 7-1	Not existed
Percutaneous shunting*	Table 7-5	Not existed
Modified items		
Surgical recanalization	Table 7-5	"Decompression"

*Percutaneous transjugular intrahepatic portosystemic shunt

rized in consideration of the treatment procedures, causal factors, number of operative mortality, number of in-hospital mortality, and used materials. An operative mortality was defined as death occurring within 30 days of surgery, regardless of its cause or hospitalization status, whereas in-hospital mortality was defined as death occurring postoperatively during the same hospital stay, regardless of its length and timing.

Discrepancies were often observed in the numerical values presented in tables. For example, the sum of causal factors or used materials did not add up to the total number of cases. A thorough investigation performed by JSVS database committee and the NCD vascular surgery data analysis team revealed that the discrepancies resulted due to the following four reasons: 1) allowing multiple choice, 2) allowing blank spaces, 3) data entry error or exclusion by an administrator, and 4) a single surgery involving multiple materials or surgery being performed at multiple sites. Since 2013, various measures have been implemented to manage this issue, such as changing or redesigning the layout of choices or possible selections to prevent data entry errors and changing programming, wherever possible, to avoid blank results.

The categories/attributes for which the registration or summary method has been changed since 2012 are presented in **Table 1**.

Results

In total, 95,979 cases (representing a 34.6% increase in relation to the previous year) of vascular treatments were registered in the NCD in 2012, accounting for 7.5% of all surgical cases registered that year.[1] Further, 1,043 institutions (representing a 16% increase in relation to the previous year) were registered for performing vascular treatment, corresponding to 30.6% of the institutions registered for all types of surgery. Among the 1,043 institutions, 447 (42.9%) were cardiovascular surgery training-certified facilities that contributed to data registration in 2012. The summarized and analytical results of 2012 for each category will be discussed below. Statistical analysis was performed using Chi-squared test, and a level of $p<0.05$ was considered statistically significant.

1. Treatment of Aneurysms (Table 2)

1) Thoracic aortic aneurysms

Most surgeries for thoracic aortic aneurysms are registered in the Japan Cardiovascular Surgery Database (JCVSD), which is managed by the JCVSD Organization. Among these, the surgeries performed by vascular surgeons are summarized in this vascular surgery database through the NCD (**Table 2**). Currently, the registration of the surgeries for thoracic aortic aneurysm performed in Japan is fragmented, complicating an accurate understanding of the overall view. A joint effort of the data registered in NCD and data registered in JCVSD will be needed to clarify the nationwide representation of thoracic aortic aneurysm surgery.

2) Abdominal aortic aneurysm (Tables 2-1 and 2-2)

A total of 15,745 cases of abdominal aortic aneurysm(AAA) (including common iliac artery aneurysm) were registered in the NCD in 2012, representing an increase of 2,527 cases in relation to the previous year.[1] The number of replacement surgery including those using bifurcated synthetic or straight-type synthetic grafts increased by 1,135 cases, accounting for 52.2% of the total number of cases. Furthermore, the number of endovascular aneurysm repair (EVAR) using stent grafts increased by 1,622 cases, accounting for 47.6% of the total number of cases. Conversely, aneurysm exclusion with bypass and hybrid surgery decreased by one-half.

Of 8,250 cases of AAA surgery, excluding EVAR cases, 1,175 required renal artery clamping and 303 required renal artery reconstruction, representing 3.7% of open repair cases (1.9% of total AAA cases). Considering the increasing popularity of stent grafts, it was expected that percentage of pararenal AAA treated with open surgical repair was increasing; however, the increase was limited. In-hospital death rate in ruptured AAA cases with renal artery reconstruction was 24.4%, whereas those in ruptured AAA with renal artery clamping represented 26.5% of cases; these numbers remain nearly unchanged since 2011. In-hospital deaths following elective surgery with renal artery reconstruction, excluding rupture cases, represented 3.1% of cases, whereas in-hospital deaths following renal artery clamping accounted for 2.3% of cases. Remarkably, these values improved since 2011.

The number of treatments performed for rupture was 1,704, which represented an increase of 451 cases compared with that in 2011. The operative mortality rate within 30 days was 17.8%, whereas the in-hospital mortality rate was 21.0%; both decreased by approximately

Table 2 Treatment for aneurysm

Table 2-1 Aortic aneurysm

Region of aortic aneurysm	Cases	Gender		Mortality		Ruptured aneurysm			Etiology								
		Male	Female	30-day mortality	Hospital mortality	Cases	30-day mortality	Hospital mortality	Dissection*3)	Degenerative*4)			Inflam-matory	Vasculitis	Infected	Connective tissue disease*5)	Others
										Cases	30-day mortality	Hospital mortality					
Ascending aorta*1)	343	168	175	46	50	43	13	15	223	293	40	42	1	0	1	18	30
Aortic arch*1)	610	466	144	46	58	46	14	15	174	536	42	53	3	0	9	27	35
Descending thoracic aorta*1)	641	464	177	27	34	77	8	11	198	556	34	30	2	1	22	22	37
Thoracoabdominal aorta*1)	385	283	102	38	46	60	17	19	94	326	34	40	5	1	15	10	27
Abdominal aortic aneurysm*2)	15,745	13,073	2,671	420	531	1,704	303	357	592	14,897	378	472	296	7	248	36	259
with renal artery reconstruction	303	266	37	16	19	45	10	11	28	276	15	18	7	1	6	4	9
with renal artery clamping	1,175	995	180	75	84	234	57	62	66	1,087	66	76	36	1	25	4	22

*1) These data are not including cases recorded in JCVSD Database in which most cardiac surgeons were entering their cases.

*2) Including common iliac artery aneurysm.

*3) Including both acute and chronic aortic dissection.

*4) Most likely atherosclerotic.

*5) Connective tissue abnormalities such as Marfan syndrome.

Table 2-1 Aortic aneurysm (continued)

Region of aortic aneurysm	Treatment procedures						Graft materials*7)		
	Replacement			Exclusion with bypass	Stent graft	Hybrid*6)	Polyester	ePTFE	Others
	Cases	Y-graft	T-graft						
Ascending aorta	5			0	12	6	304	14	2
Aortic arch	8			6	261	99	281	55	2
Descending thoracic aorta	13			4	531	35	95	15	1
Thoracoabdominal aorta	32			11	174	41	167	27	7
Abdominal aortic aneurysm	8,215	6,229	1,166	85	7,495	46	7,350	361	67
with renal artery reconstruction	286	220	41	2	6	5	279	24	2
with renal artery clamping	1,156	893	204	8	7	4	1,106	55	8

*6) Debranch bypass surgery combined with two staged TEVAR is counted as one case of hybrid treatment.

*7) Only for open surgery.

Table 2-2 Abdominal aortic aneurysm mortality classified by treatment procedures

Procedure for aneurysm repair	Ruptured aneurysm			Non-ruptured aneurysm		
	Cases	30-day mortality	Hospital mortality	Cases	30-day mortality	Hospital mortality
Replacement	1,353	261	304	6,862	74	117
Exclusion with bypass	27	7	8	58	2	5
EVAR*8)	345	41	51	7,149	40	54
Hybrid	4	0	1	42	0	2

*8) EVAR: endovascular aneurysm repair

Table 2-3 Peripheral artery aneurysm

Aneurysm	Cases	Gender		Mortality		Ruptured aneurysm			Etiology					Treatment procedures						Graft material for open surgery			
		Male	Female	30-day mortality	Hospital mortality	Cases	30-day mortality	Hospital mortality	Degen-erative	Vascu-litis*9)	Infected	Trauma	Others	Replace-ment	Exclusion with bypass	Ligation/ resection	Stent graft	Coil embolism	Others	Poly-ester	ePTFE	Autogenous vessel	Others
Aortic arch branches																							
Carotid	18	10	8	0	0	3	0	0	9	3	1	1	3	4	2	7	2	2	6	3	2	1	0
Verterbral	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subclavian	53	32	20	2	1	9	1	0	34	0	3	3	13	18	7	7	16	7	6	10	11	3	0
Multiple in arch branches	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others	10	7	3	0	0	4	0	0	4	0	0	2	4	2	1	2	1	4	1	3	0	0	0
Upper limb artery																							
Axillar	22	15	7	1	1	7	1	1	15	1	0	2	4	14	4	5	0	1	1	1	8	9	0
Brachial	237	123	113	2	7	53	1	2	44	2	23	64	104	43	5	124	1	0	68	4	19	23	1
Forearm—hand	148	94	54	3	5	19	1	1	48	1	27	27	45	11	3	114	0	0	23	2	2	5	1
Others	58	37	21	0	0	19	0	0	12	1	14	7	24	5	5	38	0	0	11	1	5	4	0
Visceral artery																							
Celiac	25	21	4	1	1	4	1	1	23	0	0	0	2	6	4	2	2	10	2	4	2	3	0
Hepatic	12	10	2	1	2	3	1	2	6	1	1	1	2	2	2	2	0	7	0	0	0	3	0
Splenic	56	23	33	0	1	3	0	0	51	1	1	0	3	1	0	15	0	38	3	0	0	1	0
Superior mesenteric	27	20	7	0	0	4	0	0	20	1	4	0	2	8	2	7	2	8	2	4	3	3	0
Renal	44	20	24	0	0	1	0	0	43	0	0	0	1	11	4	15	2	8	7	3	1	7	0
Others	405	328	77	6	9	42	3	5	365	1	13	2	24	104	12	50	135	160	7	96	16	4	0
Lower limb artery																							
Femoral	487	362	125	14	25	122	10	16	215	2	69	61	140	181	24	165	13	7	119	81	94	26	2
Popliteal	184	141	43	1	2	23	0	1	162	0	4	9	9	97	70	23	4	0	3	21	46	99	0
Others	111	85	26	5	4	15	2	2	75	1	9	3	23	18	6	35	28	28	12	9	4	7	1
Total	1,876	1,311	563	36	58	332	21	31	1,109	15	169	182	399	514	145	610	203	278	267	230	210	197	5

*9) Including TAO, Takayasu aortitis, collagen disease related vasculitis, Behçet disease, fibromuscular dysplasia.

Abbreviations; Y-graft: Y-shape artificial graft, T-graft: straight shape artificial graft, Polyester: polyester artificial graft such as Dacron graft, ePTFE: expanded polytetrafluoroethylene graft

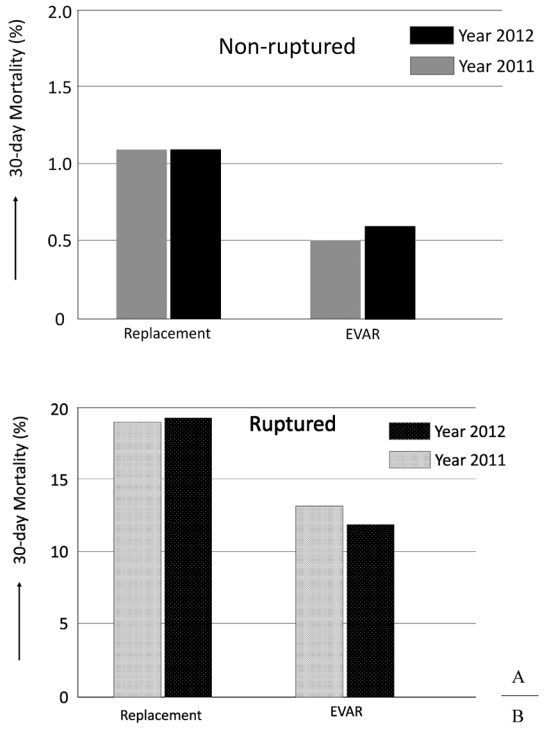

Fig. 1 Early clinical results of abdominal aortic aneurysm (AAA) in year 2012 comparing with those in year 2011. The operative mortality rate of non-ruptured AAA (**Fig. 1A**) and the ruptured AAA (**Fig. 1B**). Regarding the statistical difference of mortality rates between open repair (replacement) and EVAR, see main text.
EVAR: endovascular aneurysm repair

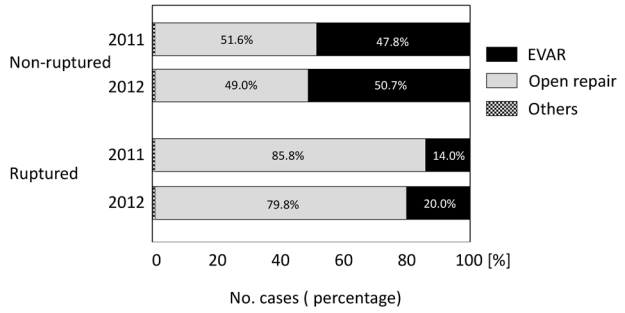

Fig. 2 Treatment procedure for non-ruptured and ruptured abdominal aortic aneurysm (AAA). Comparing year 2011, proportion of EVAR selection increased especially in rupture cases of AAA.

1% compared with the rates observed in 2011. On the other hand, the operative mortality rate following elective surgery, excluding rupture cases, was 0.8%, whereas the in-hospital mortality rate was 1.2%; both remain nearly unchanged since 2011. Further, the operative mortality rate of patients on maintenance dialysis was 4.8% and in-hospital death rate was 7.1%, indicating that both deteriorated since 2011.

A stratified analysis was performed on the early outcomes of replacement surgery and EVAR for cases with and without rupture (**Table 2-2**). The operative mortality rate of replacement surgery for non-rupture cases was 1.1% and in-hospital mortality rate was 1.7%, whereas the rates for EVAR using stent grafting were 0.6% and 0.8%, respectively. Therefore, EVAR displayed significantly better outcomes than replacement surgery ($p<0.001$) in terms of operative and in-hospital mortality rates. On the other hand, the operative mortality rate for replacement surgery in rupture cases was 19.3% and in-hospital mortality rate was 22.5%, whereas the rates for EVAR were 11.9% and 14.8%, respectively. Similarly, EVAR exhibited significantly better outcomes than replacement surgery ($p<0.001$) in terms of operative and in-hospital mortality rates (**Fig. 1**). Reflecting these clinical experiences, EVAR was possibly selected in 20% of rupture cases (representing a 6% increase in relation to the previous year), showing an increasing trend of selection of EVAR as a treatment choice for ruptured AAA cases (**Fig. 2**). Caution is needed when we directly compare operative mortality rates of open repair with those of EVAR, because EVAR may be more frequently selected for patients considered anatomically or hemodynamically favorable.

3) Peripheral arterial aneurysm (Table 2-3)

In total, 1,876 cases of peripheral arterial aneurysm were registered. The male to female ratio was 1,311:563, indicating a higher incidence in men. Further, the number of incidences based on body parts were as follows: 782 cases, lower limb arteries; 569 cases, abdominal visceral artery aneurysms; 465 cases, upper limb arteries; and 81 cases, branches of aortic arch. Regarding incidences in different arteries, femoral artery aneurysms were most frequently observed (26.0%), followed by "others." We attempted to investigate the reason for this large proportion of "others" and found that a majority of "others" included internal iliac artery aneurysms. Considering this observation, the registration method of internal iliac artery aneurysms was directed toward amendment. In total, 332 cases were rupture cases (17.7%), which frequently occurred in the thigh or upper limbs, and this trend was similar to that reported in 2011. Treatment procedures were distributed as follows: ligation/resection (35.5%), replacement (27.4%), coil embolization (14.8%), and stent grafting (10.8%). The proportion of stent grafts has increased since 2011.

2. Revascularization for Chronic Arterial Occlusion (Table 3)

1) Aortic arch branch/upper limb/abdominal visceral artery

No major changes have occurred in the number of cases of the carotid artery, vertebral artery, subclavian artery,

Table 3 Revascularization for chronic arterial occlusive diseases*10)

Table 3-1 Arterial reconstruction for aortic branches

Aortic branches	Cases	Gender		Mortality	Backgrounds		Etiology					Revascularization procedures										Graft materials*15)			
												CAS		CEA											
		Male	Female	30-day mortality	Dialysis cases	Redo ope*11)	ASO	TAO	Vasculitis*12)	Takayasu arteritis	Others	Cases	Brain complication*13)	Cases	Brain complication*13)	PTA/stent*14)	Replacement	Anatomic bypass	Carotid-Subclavian bypass	Autogenous bypass	Others	Polyester	ePTFE	Autogenous vein	Others
Carotid artery	116	97	19	3	9	4	95	0	0	2	19	16	0	79	4	1	3	7	7	3	6	7	6	3	2
Vertebral artery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subclavian artery	117	85	32	1	16	12	83	0	3	1	30					42	0	13	13	37	18	21	40	0	6
Multiple lesions of arch branches	21	16	5	0	2	2	16	0	0	0	5	0	0	0	0	0	0	5	0	2	14	3	1	2	3
Upper limb including axillar artery	107	71	36	0	40	19	73	2	4	0	27					38	1	18	1	23	28	12	10	17	5
Celiac/superior mesenteric artery	122	90	32	0	19	7	98	0	2	0	22					67	11	19	0	2	23	18	6	7	1
Renal artery	167	131	36	0	5	9	134	0	3	2	27					147	4	7	0	1	8	6	2	2	1
Others	73	56	17	0	8	5	45	0	4	0	24	0	0	0	0	27	3	13	8	12	21	13	15	3	13
Total	711	540	171	4	98	57	534	2	16	5	152	16	0	80	4	322	21	77	28	77	115	78	74	34	30

Table 3-2 Arterial reconstruction for chronic lower limb ischemia

From aorta to lower limb arterial system	Cases	Gender		Mortality	Backgrounds		Etiology					Graft materials*15)			
		Male	Female	30-day mortality	Dialysis cases	Redo ope.	ASO	TAO	Vasculitis	Takayasu arteritis	Others	Polyester	ePTFE	Autogenous vein	Others
Aorto–aorto bypass	62	44	18	0	7	5	56	1	1	1	3	41	21	3	0
Infrarenal aortic reconstruction (suprarenal clamp)	36	24	12	0	1	1	32	0	0	0	4	34	3	1	0
Aorto–femoral bypass*16)	739	608	131	8	49	64	708	5	1	3	19	569	198	30	6
Femoro–popliteal (above knee) bypass	2,139	1,615	524	35	254	257	2,117	3	1	2	11	386	1,538	334	27
Infragenicular arterial bypass	1,874	1,381	493	33	548	368	1,796	19	8	3	27	126	411	1,376	92
Femoro–popliteal (below the knee) bypass	729	532	197	13	144	130	707	2	0	1	8	81	274	405	32
Femoro–crural/pedal bypass*17)	1,173	870	303	20	411	241	1,117	17	8	2	19	46	147	998	61
Others	194	143	51	2	22	32	179	0	1	1	13	71	86	38	4
Total	4,800	3,625	1,175	72	853	697	4,649	26	12	8	76	1,100	2,113	1,682	124

Table 3-3 Extra-anatomic bypass*[18)]

Extra-anatomical bypass	Cases	Gender		Mortality	Backgrounds		Etiology			Graft materials*[15)]			
		Male	Female	30-day mortality	Dialysis cases	Redo ope.	ASO	TAO	Others	Polyester	ePTFE	Autogenous vein	Others
Carotid–subclavian bypass	28	22	6	0	3	2	13	0	15	14	12	2	1
Axillo–axillar bypass	77	64	13	1	7	5	45	0	31	23	46	3	21
Axillo–femoral bypass*[19)]	427	299	128	16	59	57	389	5	31	168	264	23	5
Femoro–femoral cross-over bypass	1,004	810	194	13	74	100	982	2	19	283	685	56	18
Others	159	103	56	4	33	36	142	1	14	46	69	22	2
Total	1,653	1,269	384	32	172	195	1,534	8	105	523	1,044	104	46

Table 3-4 Thromboendarterectomy*[20)] for chronic lower limb ischemia

Thromboendarterectomy	Cases	Gender		Mortality	Dialysis cases	Etiology		
		Male	Female	30-day mortality		ASO	TAO	Others
Aorto–iliac lesion	59	46	13	2	15	54	0	2
Femoro–popliteal lesion	851	631	220	7	198	834	2	5
Others	108	81	27	1	25	101	0	5
Total	1,008	751	257	10	236	983	2	12

Table 3-5 Endovascular treatment for chronic lower limb ischemia*[14]

Endovascular treatment	Cases	Gender		Mortality		Dialysis cases	Etiology		
		Male	Female	30-day mortality	Hospital mortality		ASO	TAO	Others
Aorto–iliac lesion*[21]	2,922	1,399	523	31	41	357	1,884	3	35
Femoro–popliteal lesion*[21]	2,436	1,706	730	23	44	650	2,421	4	11
Infrapopliteal–ankle lesion*[21]	1,277	848	428	19	47	584	1,262	7	8
Others	57	39	18	0	0	20	50	1	6
Total (number of regions underwent EVT)*[21]	5,792	4,336	1,455	59	106	1,318	5,727	12	53
Total (number of limbs underwent EVT)*[22]	4,944	3,719	1,224	46	83	1,046	4,889	9	46

∗10) Bypass surgery combined with endovascular treatment is counted in both bypass category (**Table 3-2**) and endovascular category (**Table 3-5**).
∗11) Including redo operation only. Revision surgery cases should be counted in vascular complication part (see **Table 6**).
∗12) Including collagen disease related vasculitis, Behçet disease, fibromuscular dysplasia.
∗13) Postoperative irreversible brain complication.
∗14) Including percutaneous transluminal angioplasty (PTA), stent, and other endovascular means such as catheter atherectomy.
∗15) Only for open surgery.
∗16) Including aorto–iliac bypass or ilio–femoral bypasses.
∗17) Including popliteal–crural (or pedal) bypass.
∗18) Cases underwent extraanatomic bypass because of graft infection should not be included in this category. Those cases are listed in vascular complication (**Table 6**).
∗19) A case underwent axillo–femoro–femoral crossover bypass is counted as on case. A case combined with additional contralateral side of axillilo–femoral bypass as second staged surgery is counted as 2 cases.
∗20) Including patch plasty.
∗21) When endovascular treatment performed for multiple region, the case should be counted in each region (If a case underwent endovascular treatment in both aorto–iliac and femoro–popliteal region, this case can be counted one in aorto–iliac, and one in femoro–popliteal region).
∗22) Counting the patients number. When a case underwent endovascular treatment in multiple regions, the case is counted as one case.
Abbreviations; ASO: arteriosclerosis obriterance, TAO: thromboangiitis obliterans (Buerger's disease), CAS: carotid artery stenting, CEA: carotid endarterectomy, PTA: percutaneous transluminal angioplasty, EVT: endovascular treatment, IIA: internal iliac artery

and multiple aortic arch lesions compared with the number observed in 2011. However, the number of cases has increased for other arteries including the axillary to upper limb artery, celiac artery/superior mesenteric artery, and renal artery. Further, no significant differences were observed in terms of sex, disease causes, or surgical procedures.

The number of cases of the carotid artery has remained essentially constant, with 118 cases observed in 2011 and 116 cases in 2012. In 2011, 80% of cases underwent carotid endarterectomy (CEA) and 10% underwent carotid stenting (CAS). In 2012, 68% of cases underwent CEA and 14% of cases underwent CAS, representing a slight increase in the proportion of CAS. Anatomical bypass or carotid-to-subclavian artery bypass increased to seven cases in 2012, but the latter was believed to be performed during debranching surgery associated with thoracic endovascular aneurysm repair (TEVAR). The proportion of "others" increased by approximately 50% from 49 cases in 2011 to 73 cases in 2012, but most of these included carotid-to-subclavian artery bypass or axillo–axillary bypass performed as debranching surgery associated with TEVAR, and the increase was believed to be caused by the increase of TEVAR requiring debranching surgeries.

2) Anatomical bypass, extra-anatomical bypass, and endovascular treatment in the aorta to lower limb regions

Aorto-iliac region: Anatomical revascularization surgery on lesions in the aorto-iliac region increased by approximately 7% from 782 cases in 2011 to 837 cases in 2012, but there was no change in the distribution of the types of vascular grafts used. The use of extra-anatomical revascularization surgery represented by axillo–femoral bypass and femoro–femoral bypass tended to increase slightly from 397/961 cases in 2011 to 427/1,004 cases in 2012. Endovascular treatment (EVT) also increased from 2,569 cases in 2011 to 2,922 cases in 2012, and the treatment in this region has shown a slight overall increase in Japan. Notably, the rate of increase was larger for EVT than for bypass surgery (**Fig. 3**), and EVT is now considered the first-line treatment for this region.[1]

Superficial femoral artery region: The number of femoral above-knee popliteal artery bypass increased by 125

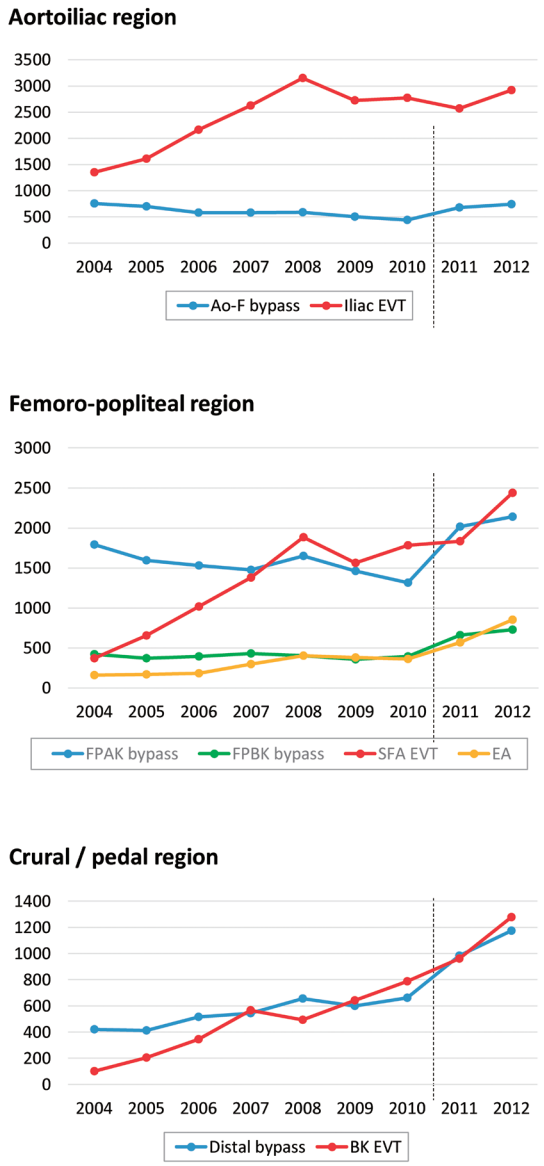

Fig. 3 The annual trends of the number arterial reconstructions in aortoiliac, femoro–popliteal, and crural/pedal region, comparing open repair and endovascular treatment. The broken line lying between year 2010 and 2011 indicates the timing of alteration of data collection methods. Data has been prospectively registered since January 2011, while the data had been retrospectively collected annually from 2004 until 2010.
Ao–F: aorto–femoral, EVT: endovascular treatment, FPAK: femoro–popliteal (above the knee), FPBK: femoro–popliteal (below the knee), SFA: superficial femoral artery, EA: endarterectomy, BK: below the knee

cases from 2,014 cases in 2011 to 2,139 cases in 2012; the incidence of EVT in this region increased by 602 cases from 1,834 cases in 2011 to 2,436 cases in 2012 (**Fig. 3**). EVT is being more commonly performed possibly because the treatment protocol is shifting from bypass surgery to EVT and because EVT is a less-invasive procedure. Conversely, no major changes were observed in the selection of vascular grafts.

Revascularization below the knee joint: Femoral below-knee popliteal artery bypass and femoro–crural/pedal artery bypass were performed on 658 and 984 cases in 2011, respectively, which increased by approximately 260 cases to 729 and 1,173 cases in 2012, respectively. Endovascular treatment increased by 316 cases from 961 cases in 2011 to 1,277 cases in 2012 (**Fig. 3**). Further, there was no substantial difference in terms of the proportion of dialysis patients, and the overall number was believed to have increased due to an increase in the incidence of critical limb ischemia with basal conditions of diabetes or dialysis.

Thromboendarterectomy: There were 50 and 568 cases of thromboendarterectomy performed in the iliac artery and femoro–popliteal regions in 2011, respectively, which increased to 59 and 851 cases in 2012, respectively, with a substantial increase in the femoro–popliteal region (**Fig. 3**). Common femoral artery lesions are observed in the femoro–popliteal region, so the use of endarterectomy in this region is believed to have increased.

3. Revascularization for Acute Arterial Occlusion (Table 4)

Percutaneous transluminal angioplasty (PTA) with or without stenting is a treatment procedure being more commonly performed, increasing from 8.5% of total cases in 2011 to 10.6% of those in 2012. This particularly includes an increase from 7.5% to 10.3% in the femoro–popliteal region, which is believed to reflect the popularization of EVT.

In cases of occlusion, multiple regions are selected if the obstructed region ranges across a wide area; hence, the total numbers do not add up. Changes in data entry methods did not occur in this region.

4. Treatment for Vascular Trauma (Table 5)

The location of vascular injury, reasons for injury, categorization based on treatment procedure, and used vascular grafts for NCD-registered cases in 2012 are shown in **Table 5**. A total of 1,623 cases were registered, including cases of artery and vein traumas. The most common reason for vascular injury was iatrogenic conditions, with 978 such cases (60.3%). Traffic accidents comprised 134 cases (8.3%), and work-related cases included 130 cases (8.0%). Further, the most common location of vascular injury was lower limb arteries (45.3%), followed by upper limb arteries (19.9%) and abdominal aorto-iliac arteries (6.2%).

In total, 1,690 cases were registered for treatment pro-

Table 4 Revascularization for acute arterial occlusive disease*23)

Obstructive artery*24)	Cases	Gender		Mortality		Etiology			Procedure					Graft materials for open surgery			
		Male	Female	30-day mortality	Hospital mortality	Embolism	Thrombosis*25)	Others	Thromb-ectomy ± patch	Bypass	Replacement	PTA ± stent	Others	Autogenous vessel	Polyester	ePTFE	Others
Carotid artery	3	2	1	2	2	1	2	0	0	1	0	1	1	0	1	0	0
Subclavian artery	63	31	32	5	6	28	20	15	32	18	4	9	3	3	15	7	0
Axillar artery	66	24	42	4	5	37	25	4	52	8	0	5	3	3	2	7	0
Brachial artery	727	353	374	14	19	350	355	22	597	16	9	35	94	17	12	20	3
Celiac/superior mesenteric artery	108	70	38	12	17	50	30	28	53	31	2	8	16	21	6	7	0
Renal artery	17	10	7	2	2	5	2	10	2	3	0	6	6	1	2	0	0
Abdominal aorta–iliac artery	723	501	222	76	99	260	371	92	430	210	17	141	35	15	120	112	5
Femoro–popliteal artery	2,433	1,571	862	191	244	1,019	1,310	103	1,976	303	33	250	139	121	142	173	12
Crural artery	729	473	256	49	71	334	374	20	590	74	4	97	59	52	21	30	6
Pedal artery	51	35	16	6	8	26	24	1	41	7	0	5	3	5	2	1	1
Others	314	205	109	14	21	46	222	46	203	60	4	40	34	43	15	21	4
Total	4,600	2,879	1,721	310	404	1,882	2,401	316	3,472	635	65	489	349	246	288	339	29

*23) Cases with non-traumatic acute arterial occlusion are listed in this table. Please see **Table 5-1** for acute arterial occlusion by trauma.

*24) The most proximal occluded artery name is described in case whose primary occluded artery could not be identified.

*25) Cases with acute worsening occlusion of chronic arterial occlusive disease are excluded. Treatment for those cases are listed in **Table 3**.

Table 5 Treatment for vascular trauma

Table 5-1 Arterial trauma

Injured artery	Cases	Gender		Mortality		Cause of trauma				Procedure							Graft materials			
		Male	Female	30-day mortality	Hospital mortality	Traffic accident	Labor accident	Iatro-genic	Others	Direct closure	Patch plasty	Replace	Bypass	Endo-vascular	Ligation	Others	Auto-genous vessel	Polyester	ePTFE	Others
Carotid artery	56	38	18	2	5	0	2	10	44	13	0	0	35	3	7	2	0	13	23	4
Subclavian artery	74	51	23	6	6	4	4	13	53	12	0	0	52	6	6	5	1	19	33	4
Axillar artery	26	21	5	1	1	5	6	6	9	6	0	3	14	1	2	2	6	0	11	0
Brachial artery	223	150	73	3	5	5	22	169	27	157	3	6	18	3	34	10	21	0	6	0
Descending aorta (thoracic/thoracoabdominal)	50	34	16	18	19	23	7	5	15	10	0	5	3	18	3	13	0	3	5	0
Celiac/superior mesenteric artery	29	19	10	3	4	8	1	11	9	6	0	0	4	13	8	0	1	1	1	0
Renal artery	10	6	4	1	0	3	1	5	1	2	0	0	0	7	0	1	0	0	0	0
Abdominal aorta–iliac artery	101	58	43	17	22	13	6	62	20	33	3	11	8	33	9	14	2	12	9	0
Femoro–popliteal artery	703	430	273	93	124	33	37	503	130	550	20	31	44	17	33	29	49	15	28	2
Crural artery	32	23	9	0	1	7	5	13	7	5	0	2	16	2	5	2	13	1	3	0
Others	227	141	86	21	30	22	27	105	73	85	3	4	7	16	103	24	8	3	1	2
Total	1,476	934	542	161	211	118	117	897	344	876	27	61	155	115	203	99	99	53	87	8

Table 5-2 Venous trauma*[26)]

Injured vein	Cases	Cause of trauma				Procedure							Graft materials			
		Traffic accident	Labor accident	Iatrogenic	Others	Direct closure	Patch plasty	Replace	Bypass	Endo-vascular	Ligation	Others	Autogenous vessel	Polyester	ePTFE	Others
Superior vena cava	3	0	0	2	1	2	0	0	0	0	1	0	0	0	0	0
Inferior vena cava	8	3	1	2	2	6	1	0	0	0	0	1	0	0	0	1
Brachiocephalic–subclavian vein	14	0	1	5	8	5	0	0	0	3	3	4	0	0	0	0
Iliac–femoral–popliteal vein	45	3	4	31	7	34	2	1	1	0	7	3	2	1	1	0
Others	79	10	7	42	20	30	2	4	3	1	37	6	2	1	4	0
Total	147	16	13	81	37	75	5	5	4	4	47	14	4	2	5	1

*26) Cases with vessel injury involving both vein and accompanying artery are listed in **Table 5-1**.

cedures, while hemostasis and repair by direct suture comprised 58.6% of total cases. Additionally, only 259 cases received vascular grafts, but approximately 40% of all vascular grafts were autogenous grafts. Autogenous grafts appear to be selected for revascularization of peripheral vessels whenever possible because traumatic wounds are often infected.

1) Iatrogenic vascular trauma

The most common type of iatrogenic vascular injury is considered the complications associated with catheter-involving operations. Other than injuries acquired during examinations or treatments for cardiovascular diseases, injury may occur during catheter embolization of visceral arteries for malignant tumors, intra-arterial chemotherapy, or intravenous feeding catheters. In addition, injury may result from accidental vascular injury during surgery.

Lower limb arteries were the most common site of iatrogenic vascular injury (approximately 55% cases), followed by upper limb arteries (approximately 20% of cases); most of these cases are believed to be complications of catheter puncture sites.

2) Traffic accidents

A total of 134 cases of vascular injury caused by traffic accidents have been registered. However, it is unknown whether this small number of cases reflects the actual situation. The most frequent region of injury was lower limb arteries, comprising approximately 37% of cases; this is likely because the vessels of the lower limbs are close to the body surface and are prone to direct external force. The second most frequent injury site was the descending or thoracoabdominal aorta (17%), followed by upper limb arteries (10%) and abdominal aorto-iliac arteries (10%) (**Fig. 4A**). During traffic accident collisions, the mediastinum is dislocated due to sudden deceleration, focusing stress on the bifurcation area between the cervical/upper limb branches fixed to the thorax. This subsequently causes dissection or laceration/interruption of the descending thoracic aorta in the branching site of the left subclavian artery. The higher proportion of damage in the thoracic aorta than those of the other causes of vascular injury is possibly a result of the exclusivity of traffic accident-related traumas.

3) Work-related trauma

Causes categorized as "work-related" in the NCD database are thought to include industrial accidents such as fall from high places or being caught in machinery. Of the 130 cases registered, approximately 60% occurred in the arteries of the extremities that are prone to external force owing to their proximity to the body surface, as mentioned previously (**Fig. 4B**).

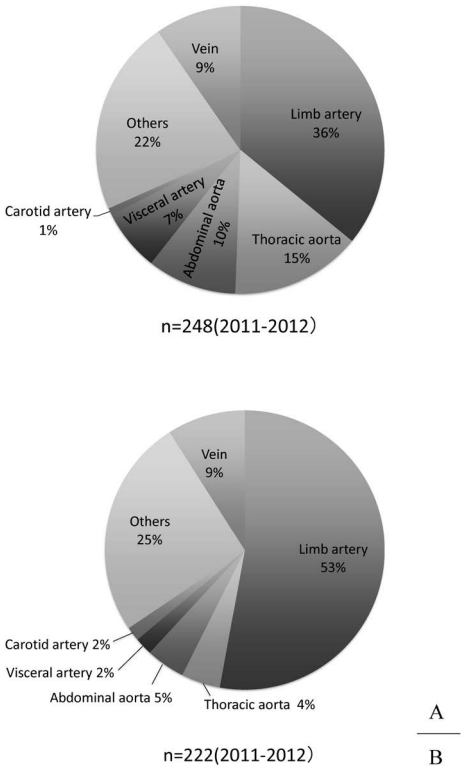

Fig. 4 The location of vascular injury in year 2011 and 2012. Injured vessel injured by traffic accident (**A**) and work-related accident (**B**).

4) Other vascular trauma

Causes of vascular injury other than iatrogenic or traffic accidents include those caused by freak accidents and due to deliberate damage (or self-inflicted injury). Disease-related vascular wall damage, such as tumor invasion to blood vessels, is considered a type of vascular injury.

The most frequent injury sites are the vessels of the extremities, comprising 66% of cases. Injuries caused in the parts resistant to direct external force, such as the thoracic/abdominal aorta or carotid artery, are likely to include those resulting from direct invasion of malignant tumors or those caused by self-inflicted injury.

We summarized the registration status of vascular injuries in the NCD database of 2012. The total number of registered cases has increased since the 2011 report, but it is unclear whether the registered number of vascular injury caused by traffic accidents reflects the actual numbers.

Notably, there were no major differences in terms of causes of trauma, areas of trauma, or types of vascular grafts used. However, the number of cases involving repair using EVT substantially increased from 5.7% of total cases (61 cases) in 2011 to 7.3% (119 cases) in 2012. This likely occurred because of the popularization of coil embolization or stent graft indwelling for the bleeding area.

5. Treatment for Vascular Complications after Revascularization (Table 6)

1) Artificial graft infection

There were 48 in-hospital deaths out of 466 total cases (10.5%). In 2011, there were 76 in-hospital deaths out of 445 cases (17.1%), indicating this rate markedly decreased by 2012. Further, there were no major differences in terms of treatment procedures or types of vascular grafts used between 2012 and 2011.

2) Anastomotic aneurysms

The category "rupture" was added in 2012. Of 178 anastomotic aneurysm cases, 50 ruptured and 7 patients died owing to operative mortality. The most frequent cause was arteriosclerosis, similar to that observed in 2011, followed by infection.

3) Autogenous graft aneurysms

The number of cases, number of operative mortality, and treatment procedures remained constant compared to those observed the previous year.

4) Artificial graft deterioration

Fifty-eight cases experienced artificial graft deterioration in 2012, which increased from 33 cases in 2011. The most frequent primary surgical procedure was bypass, followed by replacement. Moreover, there were no cases of stent graft deterioration in 2012, but reports may increase in the future due to the increase in the use of stent graft indwelling.

5) Repair operation for restenosis and acute occlusion of vascular grafts

Compared with 2011, upper limb arterial reconstruction increased by 2.2-fold and lower limb arterial reconstruction increased by 1.2-fold in 2012. Overall, arterial reconstruction increased by 1.5-fold to 1,182 cases in 2012. Regarding reconstruction procedures, PTA with and without stenting of the upper limb increased from 65 cases in 2011 to 231 cases in 2012 (3.6-fold increase). The use of autogenous grafts increased from 39 cases in 2011 to 341 cases in 2012 (i.e., an 8.7-fold increase).

6. Venous Surgery (Table 7)

1) Varicose veins (Table 7-1)

A total of 30,086 cases were registered in 2012, representing a massive increase of approximately 60% compared with 2011. Stripping (with and without sclerotherapy) was performed in 16,163 cases (54%) and was the most common surgical procedure. However, 8,186 cases of endovenous laser ablation (EVLA) with and without sclerotherapy as a novel therapeutic method were registered and comprised approximately one-fourth of all varicose vein treatments. EVLA was covered by insurance for the first time in 2011, and the equipment for radiofrequency ablation, a 1,470-nm model for EVLA, and a radially emitting laser fiber were approved in 2014. EVLA was the most common treatment reported in the 2016 Japanese Society of Phlebology survey[2] and is expected to increase in the future.

2) Deep vein thrombosis (Table 7-2)

A total of 395 cases were registered and distributed as follows: 71 cases of thrombectomy (18%), 40 of catheter-directed thrombolysis (CDT) (10%), and 9 of bypass surgery (peripheral vein revascularization) (2%). Notably, no major changes were observed in 2012 compared with 2011. The most frequent treatment was filter insertion including temporary type in 327 cases (82%). CDT remained limited.

3) Upper limb vein obstruction (Table 7-3)

Compared with 2011, the number of treatments increased by 1.7-fold in 2012 to 152 surgeries. However, no changes were observed in the distribution of treatment procedures.

4) Vena cava reconstruction (Table 7-4)

A total of 81 cases were registered, which represented a slight increase from 2011. The cases were distributed as follows: 22%, superior vena cava/primary branch reconstructions and 78%, inferior vena cava/primary branch reconstructions. The most frequent cause was tumors (55 cases, 68%). Moreover, the outcomes showed deterioration compared with those of the previous year, with seven operative deaths (8.6%) and eight in-hospital deaths (9.9%). Surgical procedures involved patching in 17 cases, replacement in 13, and bypass in 5. Forty-two cases of vascular grafts were registered, with 16 cases of ePTFE being the most frequent type.

5) Budd–Chiari syndrome (Table 7-5)

A total of nine treatments were performed. The treatment procedures were newly divided into shunt surgery, percutaneous shunt creation, and open repair; further, no PTA cases were registered. Percutaneous shunt creation is likely to represent transjugular intrahepatic portosystemic shunt.

7. Other Vascular Diseases and Related Surgery (Table 8)

No major changes were observed in the number of registered cases for other vascular diseases and related surgeries between 2011 and 2012.

Table 6 Revascularization for vascular complication after revascularization

Table 6-1 Graft infection

Position of infected graft	Cases	Mortality		Procedure for graft infection			Material for revision or redo surgery				
		30-day mortality	Hospital mortality	In-situ replace	Extra-anatomic bypass	Others	Polyester	ePTFE	Autogenous vessel	Cryopreserved homograft	Others
Thoracic descending aorta	3	0	0	2	0	1	0	1	0	1	0
Thoracoabdominal aorta	4	0	0	2	0	2	1	1	0	0	0
Abdominal aorta–iliac artery	33	8	11	7	17	9	15	9	2	0	1
Abdominal aorta–femoral artery	48	2	6	10	11	27	16	9	5	0	0
Femoro–distal artery	137	5	14	15	19	103	12	38	24	0	4
Others*27)	241	10	18	18	33	190	35	64	25	0	9
Total	466	25	49	54	80	332	79	122	56	1	14

*27) Cases with graft infection involving aortic arch branch or upper limb artery are listed on this column.

Table 6-2 Anastomotic aneurysm*28)

Location of anastomotic aneurysm	Cases	Mortality	Cause of aneurysm treated at the primary operation					Repair procedure				Material for repair surgery			
		30-day mortality	Degen-erative*29)	Takayasu arteritis	Other vasculitis*30)	Infection	Others	Replace-ment	Exclusion and bypass	Stent graft	Others	Polyester	ePTFE	Autogenous vessel	Others
Aortic arch branch	7	1	4	0	1	0	2	1	2	3	2	4	2	1	0
Upper limb artery including axillar artery	34	3	8	0	0	7	19	3	1	0	30	2	5	1	0
Thoracic aorta	18	2	11	0	0	1	6	1	0	13	6	9	6	0	0
Splanchnic artery	1	0	0	0	0	0	1	0	0	1	0	1	0	0	0
Renal artery	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0
Abdominal aorta	28	2	21	0	0	3	4	6	1	17	7	19	4	0	2
Iliac artery	22	0	12	0	0	1	9	5	0	11	8	11	4	0	5
Femoral artery	59	3	24	0	0	21	14	24	6	0	31	7	21	12	1
Popliteal or more distal lower limb artery	10	0	3	0	0	2	5	4	1	0	5	0	4	2	1
Total	178	11	82	0	1	35	60	44	11	44	88	52	46	16	9

*28) Cases with infectious pseudoaneurysms located at the anastomotic site to the artificial graft are listed in **Table 6-1**.

*29) Including the atherosclerotic aneurysm.

*30) Including TAO, collagen disease, Behçet disease, and fibromuscular dysplasia.

Table 6-3 Autogenous graft aneurysm

Revascularization area	Cases	Mortality	Repair procedure		
		30-day mortality	Replacement	Bypass	Others
Visceral artery	0	0	0	0	0
Upper limb artery	47	1	4	3	39
Lower limb artery	25	0	2	4	19
Others	19	0	0	2	17
Total	86	1	6	9	73

Table 6-4 Graft degeneration

Revascularization area	Cases	Mortality	Initial revascularization procedure				Degenerated material			Repair procedure					Material for repair surgery		
		30-day mortality	Replace	Bypass	Stentgraft	Others	Polyester	ePTFE	Others	Replace-ment	Bypass	Stentgraft	Patch plasty	Others	Polyester	ePTFE	Others
Descending thoracic aorta	1	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	0
Thoracoabdominal aorta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abdominal aorta–femoral artery	8	0	5	2	0	1	5	3	0	2	1	2	1	3	6	0	0
Femoro–popliteal artery	12	0	2	8	0	2	1	11	0	2	5	0	1	4	1	6	1
Others	38	1	5	16	0	17	9	23	6	11	4	2	1	20	7	13	4
Total	58	1	13	25	0	20	16	36	6	15	10	4	4	26	15	19	5

Table 6-5 Repair operation for graft stenosis or acute thrombosis*[31)]

Initial procedure	Cases	Mortality	Repair procedure					Material for repair surgery			
		30-day mortality	Patch ± thrombectomy	Replacement	Bypass	PTA ± stent	Others	Polyester	ePTFE	Autogenous vessel	Others
Reconstruction of aorta or its primary branches	109	4	22	6	35	43	14	38	26	9	15
Revascularization of upper limb	475	6	101	16	20	231	124	11	52	341	6
Revascularization of lower limb	604	17	287	59	154	163	50	64	149	187	12
Total	1,182	27	407	79	207	437	188	112	226	534	33

*31) Including stenosis such as the anastomotic stenosis, graft stenosis or occlusion, and restenosis at the site of endarterectomy.

Table 7 Venous surgery

Table 7-1 Varicose veins

Varicose veins treatment	Cases*32)	Male	Female	30-day mortality
High ligation ± sclerotherapy	4,651	1,540	3,111	0
Stripping ± sclerotherapy	16,163	6,291	9,870	3
Laser ablation ± sclerotherapy	8,186	2,504	5,682	0
Valve plasty	6	4	2	0
Others	1,082	322	760	0
Total	30,088	10,661	19,425	3

*32) Only one procedure can be registered in one leg.

Table 7-2 Deep vein thrombosis (DVT)

DVT treatment	Cases	Male	Female	30-day mortality
Thrombectomy	71	33	38	0
Catheter-directed thrombolysis*33)	40	23	17	0
Bypass	9	3	6	0
IVC filter insertion*34)	327	152	175	3
Total	395	181	214	3

*33) Including the catheter-directed thrombolysis using hydrodynamic thrombectomy catheter.
*34) Including temporary IVC filter.

Table 7-3 Upper limb vein obstruction

Treatment of vein obstruction	Cases	Male	Female	30-day mortality
Thrombectomy	86	48	38	1
Catheter-directed thrombolysis	19	14	5	0
Bypass	51	32	19	1
SVC filter insertion	1	0	1	0
Total	152	92	60	2

1) Popliteal artery entrapment syndrome and cystic adventitial disease

The number of cases tended to increase as observed previously, possibly reflecting an improvement in the diagnostic rate.

2) Vascular access surgery (Table 8-4)

The number of surgeries performed increased by 39.0%, and all surgical procedures including those with and without synthetic grafts showed an even increase.

3) Lymphedema surgery (Table 8-5)

The number of performed surgeries was small but increased slightly. Lymphovenous anastomosis was performed in 43 cases.

4) Sympathectomy (Table 8-6)

Sympathectomy was performed only in 39 cases, and we believe that this finding indicates the limited indication of this surgical procedure.

5) Amputation of the upper limb and lower limb (Tables 8-7 and 8-8)

There was a 34.0% increase in lower limb amputation cases, and minor and major amputations showed increased number of cases. Transfemoral (above-knee) amputations remained more common compared with below-knee amputations, and the death rate related to transfemoral amputations was as high as 9.7%, similar to that observed in the previous year (**Fig. 5**). Below-knee amputation due to ischemia is often performed in orthopedic or plastic surgery departments, and the numbers in this report only reflect a portion of the amputations performed in Japan. Data collection across specialities will be required at the earliest possible opportunity to understand the overall condition of major amputations performed in Japan. This will lead to improved limb salvage rates and will be the first step in improving the high death rate associated with amputation.

Table 7-4 Vena cava reconstruction

Vena cava reconstruction	Cases	Mortality		Etiology			Treatment procedures					Material for open surgery			
		30-day mortality	Hospital mortality	Tumor	Thrombus	Others	Patch plasty	Bypass	Replace-ment	PTA ± stent	Others	Autogenous vessel	Polyester	ePTFE	Others
SVC reconstruction	18	1	1	6	7	5	2	2	2	3	9	1	1	3	8
IVC reconstruction	63	6	7	49	3	11	15	3	11	0	34	10	2	13	4
Total	81	7	8	55	10	18	17	5	13	3	43	11	3	16	12

Abbreviations; IVC: inferior vena cava, SVC: superior vena cava

Table 7-5 Budd–Chiari syndrome

Treatment	Cases	Gender		Mortality		Material for open surgery			
		Male	Female	30-day mortality	Hospital mortality	Polyester	ePTFE	Autogenous vessel	Others
Shunting	3	1	2	0	0	0	1	1	0
Surgical recanalization	5	4	1	0	0	0	0	3	1
Percutaneous shunting	1	1	0	0	0	0	0	0	0
Total	9	6	3	0	0	0	1	4	1

Table 8 Other vascular diseases

Table 8-1 Popliteal artery entrapment syndrome

Treatment	Cases	30-day mortality
Myotomy	9	0
Revascularization	45	1
Total	49	1

Table 8-2 Adventitial cystic disease

Treatment	Cases	30-day mortality
Cyst excision ± patch plasty	43	1
Replacement	18	1
Bypass	4	0
Total	63	2

Table 8-3 Throracic outlet syndrome (TOS)

Treatment	Cases	Male	Female	30-day mortality	Type of TOS*35)		
					Neurogenic	Venous	Arterial
Rib resection*36)	3	2	1	0	1	0	3
Rib resection + scalenectomy	3	2	1	0	2	1	0
Bypass	5	4	1	0	1	0	5
Total	10	7	3	0	3	1	7

*35) In the case with mixture type, the type having the most significant impact on the clinical symptom is listed. But, if the impacts are similar, multiple response is allowed.

*36) Including cervical rib.

Table 8-4 Vascular access operation

Treatment	Cases	30-day mortality
Arteriovenous access creation by autogenous material	11,753	138
Arteriovenous access creation by artificial material*37)	2,651	48
Open surgery for access repair	2,449	45
Endovascular access repair	5,426	48
Arterial transposition	375	16
Total	22,654	295

*37) Including cases with access repair using artificial graft.

Table 8-5 Surgery for lymphedema

Treatment	Cases	Male	Female	30-day mortality
Lymphovenous anastomosis	43	7	36	0
Lymph drainage operation	5	2	3	0
Resection	56	32	24	1
Total	104	41	63	1

Table 8-6 Symphathectomy

Symphathectomy	Cases	30-day mortality
Thoracic sympathectomy	30	1
Lumbar sympathectomy	9	0
Total	39	1

Table 8-7 Amputation of upper limb

Amputation level	Cases	30-day mortality
Digit	18	0
Forearm/upper arm	5	1
Total	23	1

Table 8-8 Amputation of lower limb*[38)]

Amputation level	Cases	30-day mortality	Etiology			
			ASO	DM-ASO	TAO	Others
Toe	540	15	207	289	6	38
Transmetatarsal	202	7	62	131	3	6
Lisfranc/Chopart	63	4	21	41	1	0
Syme	9	0	4	5	0	0
Below-knee	237	8	105	117	1	14
Through-knee/above-knee	337	33	183	112	2	40
Hip	2	0	1	0	0	1
Total	1,390	67	583	695	13	99

*38) Amputations not due to ischemia are not included.
Abbreviations; ASO: arteriosclerosis obriterance, DM-ASO: diabetic ASO, TAO: thromboangiitis obliterans (Buerger's disease)

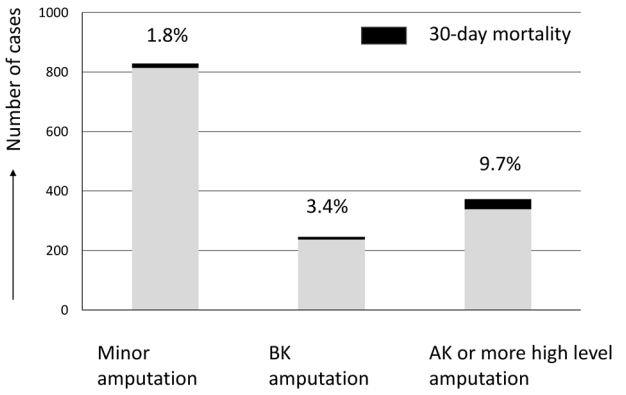

Fig. 5 The number of lower limb amputations and their mortality rates in each amputation level. The value on the top of each bar indicates the 30-day mortality rate. The mortality rate after amputation surgery became significantly higher in according to higher amputation level ($p<0.001$).
BK: below the knee, AK: above the knee

Conclusions

Since the NCD registration began in 2011, an overall representation of vascular surgery in 2012 has been established. Although these results show simple statistics, observation of the current state of vascular surgery in Japan is possible, along with the understanding of gradual changes in the contents of vascular surgery.

One of the largest goals of establishing the NCD is to improve the quality of medicine using NCD data. In this aspect, there are several tasks requiring future investigation, with the first task being entry criteria. The current criteria are determined based on attributes used in vascular surgery questionnaires established prior to the establishment of the NCD. However, they are insufficient in evaluating the quality of current medical services. Considering that data are entered in the midst of busy clinical works, determining which items are essential for vascular registry is one of our next tasks. The other task is to determine an indicator for vascular treatment quality. The operative mortality rate is fortunately low in most vascular surgeries other than major vascular surgery; hence, it cannot be used as an indicator. Therefore, the aim is to implement a function in the NCD to compare the risk adjusted quality indicator of vascular treatment in each institution with national standards. JSVS has initiated several model studies to tackle these future tasks. Additionally, site visits

will be introduced in this fiscal year to improve data reliability.

We hope to further develop the vascular surgery database of the NCD with the help of JSVS members. We sincerely hope that this database will assist in providing high-quality medical service to patients suffering from vascular diseases.

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Appendix

Team responsible for analyzing the 2012 annual report as follows;

Database Management Committee of JSVS: Nobuyoshi Azuma (Chairman), Yukio Obitsu (Vice-chairman), Nobuya Zempo, Yoshinori Inoue, Kunihiro Shigematsu, Ikuo Sugimoto, Hitoshi Okazaki, Hideaki Obara, Hirono Satokawa, Daisuke Fukui, Akihiro Hosaka, Tetsuro Miyata (Chief director of JSVS)

NCD Vascular Surgery Data analyzers: Arata Takahashi, Hiroaki Miyata

Disclosure Statement

There are no conflicts of interest among all coauthors.

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