Annals of the Royal College of Surgeons of England (1990) *vol.* 72, 287–290

Local audit in vascular surgery

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Key words: Audit; Complications; Workload; Vascular surgery

A 2-year audit of the Southampton Vascular Unit showed marked discrepancies in workload from nationally accepted figures. All forms of reconstructive surgery except emergency aortic aneurysm grafting were performed more frequently than expected. The vascular population is elderly and at high risk from major surgery. Mortality was appreciable in all major vascular procedures and usually cardiac or renal related.

The elderly population and resulting workload is likely to increase in the near future. The role of local audit in vascular surgery is emphasised.

In recent years the Vascular Surgical Society of Great Britain and Ireland (VSS), has been collecting data on vascular workload in order to rationalise elective and emergency vascular services for the future. A report to the annual general meeting of the Vascular Advisory Committee (VAC) in 1987 gives approximate vascular workload statistics gathered from audit of Regional Health Authorities in the United Kingdom, and recommends staffing levels of two vascular surgeons per 250 000–500 000 of population *(1)*. Other vascular audits *(2)* have emphasised the inaccuracy of national audits, especially the Hospital Inpatient Enquiry (HIPE) system in respect of vascular surgery, and also noticed differences in workload from previous VAC estimates.

As the Southampton Vascular Unit corresponds to the VSS recommendations on staffing with two consultants and junior staff, we undertook an audit of our unit to compare actual workload with that expected from other sources. We also audited the population group undergoing vascular surgery and the outcome of this intervention as a baseline for continuing audit, and to assess implications for the present and future practice of vascular surgery.

Materials

The vascular unit of the Southampton district is based at the Royal South Hampshire Hospital, serves a direct population of 414 000 (1986) and acts, if necessary, as a tertiary referral centre for surrounding districts. The unit work comprises elective and emergency vascular cases, although some of the latter are shared with a third general surgical firm. The unit is staffed by two consultants (with general surgical commitment also), one rotating general surgical senior registrar, two registrars and two housemen. All major reconstructions, including carotid procedures, are nursed postoperatively in a shared two-bedded high care facility for a minimum of 24 hours. There is no dedicated anaesthetist for this unit or for vascular surgery. The vascular unit is on a separate site 2 miles from the blood transfusion laboratory, casualty department and the district intensive therapy unit (ITU). There are no renal dialysis facilities in the city of Southampton.

Methods

The records of all vascular patients admitted to the unit over a 2-year period, January 1985 to December 1986, were studied. Patient names were obtained from operating theatre registers and ward admission records. Data of the type and source of admission, significant medical disease, mode of presentation, investigation, treatment and complications were retrieved from the records. In half of the cases information was available from specially designed vascular clerking booklets attached to the notes.

Those patients with significant coexisting medical disease were identified as such on the basis of receiving specific treatment.

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Results

Workload

The total number of admissions for vascular disease is shown in Table I. The increase in cases between the two years of 8.5% is typical of the average yearly increase in the overall surgical workload in the district over the last 5 years.

The relatively small increase in operative procedures, in spite of large increases in proximal reconstruction and percutaneous transluminal angioplasty (PTA), would appear to be associated with a 28% fall in the amputation rate (Table II). The extra-district referral rate remained steady at 8%.

A total of 1320 vascular procedures were undertaken of which 1150 were operative and 170 transluminal dilatations. Elective major cases, including insertion of grafts and endarterectomies, comprised 306 and 312 cases, respectively, for the 2 years. This represents an average over a full year of six cases per week.

When individual procedures are considered, there was a marked increase in proximal reconstruction of just under 50%. In contrast there was a slight fall in distal reconstructions, which appears related to the greater use of peripheral PTAs.

In addition to the vascular unit's workload, a further 23 leaking aortic aneurysms and 24 peripheral embolectomies were performed over the same 2-year period at the Southampton General Hospital.

Comparison of workload

When compared to the VAC survey and the Oxford audit, obvious differences are seen (Table III). Despite the number of new patients per year being similar to that expected, the proximal grafting rate is 100% more than expected from the VAC figures, or found in the Oxford audit. Like Oxford, the leaking aneurysm rate is roughly half that expected from the VAC survey. Similar marked discrepancies were found with distal grafting, acute limb ischaemia and carotid endarterectomies.

Population group

The vascular population treated was essentially elderly and a high proportion had significant medical disease (Table IV). Overall, 70% of vascular patients were smokers, one-third suffered angina and one-fifth had survived myocardial infarction. Of those undergoing surgery 95% had one or more risk factors.

Table I. Vascular workload of unit

	1985	*1986*
Total admissions*	840	869
Total patients treated	508	551
Total operations (including TLD†)	652	667
Emergency admissions	130	131
Patients transferred from other units	47	36
Patients from outside district	37	52

* Including admission for arteriography
† Transluminal dilatation

Postoperative complications

Mortality and the main vascular complications of major reconstructions are outlined in Tables V–VII. Mortality was appreciable in all major surgery and was almost invariably cardiac or renal related.

Discussion

In its report to the Vascular Surgical Society in November 1987, the Vascular Advisory Committee (VAC) reported statistics gathered from individual

Table II. Breakdown of operative procedures over audit period

	1985	*1986*
Grafts		
Aorto-ilio-femoral	82	120
Thoracoabdominal aortic	5	3
Femoropoliteal-distal	104	97
Axillo bifemoral	10	6
Upper limb	8	5
Others	10	10
Total	219	241
Endarterectomy		
Carotid	53	45
Others	34	26
Total	87	71
Transluminal dilatation		
Iliac	21	21
Femoropopliteal-distal	53	67
Renal	1	1
Others	2	3
Total	77	92
Sympathectomy		
Lumbar—operative	21	28
—phenol	28	22
Cervical	3	2
Total	52	52
Thromboembolectomy	24	36
Amputations		
Above knee	21	10
Below knee	38	32
Through knee	20	17
Others	57	37
Total	136	96
Re-exploration		
Haemorrhage	16	24
Occlusion	8	10
Profundoplasty	1	6
1st rib resection	4	4
Others	28	35

Table III. Comparison of Southampton vascular workload, Oxford audit, and VAC survey

	VAC	*Oxford**	*Southampton†*
Population	500 000	522 000	414 600
New patients	400–600	—	551
Aorto-ilio-femoral (including aneurysm)	60	50	120
Ruptured aneurysms	40–60	15	23‡
Femorodistal (including profundoplasty)	60–80	29	103
Major amputations	60	75	59
Trauma/acute limb ischaemia	60–80	—	123‡
Carotid endarterectomy	10–20§	25	53

* 1984–1985 period
† 1986 figures
‡ Including surgery at Southampton General Hospital
§ Figures from Darke and Bell *(11)*

regions on vascular workload relative to population. These figures were remarkably constant on an inter-regional basis for referral rate and numbers of major procedures performed. Since their consideration by the VAC, further detailed data collection has been deemed unnecessary and it is assumed that the figures may be used as a template for resource planning and surgeon training.

Following the Oxford audit in 1987 *(2)*, which roughly echoed VAC predictions, we undertook an audit of this unit as our actual workload seemed high in comparison with that expected. Indeed our results have shown that for the three main categories of carotid endarterectomy, proximal, and distal reconstructions, about double the number of procedures were performed annually than predicted. Only for leaking abdominal aortic aneurysms was workload less than expected, but this may well reflect the earlier referral of such patients for elective repair.

Table IV. Age and percentage of patients with medical conditions undergoing major vascular surgery

	Aortic surgery (n = 210)	*Distal reconstruction (n = 190)*	*Carotid endarterectomy (n = 98)*
Mean age (years)	68	69.3	71.6
Range	40–89	23*–88	48–85
Hypertension	36	37	48
Smoker (ex or present)	80	79	75
Diabetes	4	13	3
Previous vascular surgery	4	14	4
Previous MI†	15	17	15
Angina	6	4	9
Previous cardiac surgery	1	0	3

* Post-traumatic
† Myocardial infarction

Table V. Mortality and morbidity following proximal vascular reconstructions

	Aortic aneurysm		
Complication	*Asymptomatic or tender (n = 98)*	*Ruptured (n = 27)*	*Proximal grafting (n = 92)*
Death-on-table	0	3	0
as inpatient	6 (6.6)*	3 (22)	8 (8.7)
Haemorrhage	3 (3.3)	1 (3.7)	3 (3.3)
Graft infection	0 —	1 (3.7)	3 (3.3)
Distal embolus	1 (1.1)	1 (3.7)	1 (1.1)
Others	2 (2.2)	3 (11)	2 (2.2)

* Figures in parentheses are percentages

Table VI. Mortality and morbidity following distal reconstructions

	Femoropopliteal		
Complication	*Above-knee (n = 46)*	*Below-knee (n = 119)*	*Tibial (n = 15)*
Mortality (as inpatient)	3 (6.5)*	4 (3.4)	2 (13)
Early occlusion	1 (2.2)	9 (7.6)	5 (30)
Haemorrhage	1 (2.2)	6 (5.0)	1 (6.6)
Graft infection	0	2 (1.7)	1 (6.6)
A/V fistula	0	2 (1.7)	0

* Figures in parentheses are percentages

Table VII. Complications of carotid endarterectomy (*n* = 98)

	No. of patients
Stroke/mortality*	6
Transient ischaemic attacks	5
Cranial nerve palsy (temporary)	2
Haemorrhage (required re-exploration)	2

* Including three myocardial infarctions

Workload differences will arise from individual practice. For example, our high rate of operative lumbar sympathectomy is counter to the general trend towards chemical sympathectomy. Increased reconstructive workload could be due to a lower threshold for operative interventions, but only those with critical ischaemia or severely debilitating disease are considered for reconstruction and, in asymptomatic aortic aneurysmal disease, surgery is usually recommended for dilatations over 5 cm. A further explanation could be a greater prevalence of serious arterial disease linked to a more elderly population. In 1985, the population in the Southampton district over 65 years of age was 69 000 or 16% of the total *(3)*, which is similar to the national average *(4)*. In both cases there are projections for an increase in the pensionable population in the order of 5–10% over the next 5 years *(3,5)*. The precise reasons underlying the higher than expected vascular workload in our district remains obscure.

Comparing audit figures from two consecutive years is not always an accurate predictor of continued change, as was noted by the Oxford group *(2)*. There were, however, several apparent changed between the two years which would have profound resource and budget implications; the 50% increase in proximal aortic reconstructions and the lower rate of femorodistal bypass (probably as a consequence of wider use of PTA).

Major vascular surgery, such as proximal reconstructions on a 'high risk' elderly population necessitates perioperative high or intensive care facilities in order to minimise morbidity and mortality. Our high care facility, without separate funding, is resource expensive and critical to any budget planning. On the basis of the 'expected' VAC figures for proximal reconstructions, this facility would have been underfunded by 100%.

It is likely that transluminal angioplasty and the development of thrombolytic agents will reduce the rate of surgical intervention in the femorodistal segment of the seriously symptomatic patient. This may be counterbalanced by a lowering of the threshold for arteriography in the moderately symptomatic patient for whom dilatation represents an easy, repeatable, and less drastic intervention. This development would result in shorter hospital stays, but is likely to represent an expansion of vascular services overall.

The extra-district referral rate has important implications on workload. Although comprising only 8% of the total admissions (or roughly one patient per week), as tertiary referrals they are often complex and undergo major surgery. A substantial case could be made for regional recognition of these cases, rather than the cross-district compensation scheme which always under charges for resources used. Changes of this system are likely under the Government's White Paper on reform of the NHS.

Although audit of morbidity and mortality was not a primary purpose of this study, it has obvious implications on the workload and expenditure of a vascular unit. The appreciable mortality associated with all major vascular surgical procedures is in keeping with other reports *(6–10)*. This is almost certainly a reflection of several factors. Patient selection is crucial. In the light of more recent published work *(12)* many of these patients should have been assessed preoperatively by a cardiologist; this is now our standard practice. Postoperative care is also important. Our local situation with all major support services on distant sites to the vascular unit seems illogical. Although vascular morbidity is low (our figures also include results of very high risk procedures such as thoracoabdominal aneurysms and reoperative surgery), complications are often life or limb threatening and adequate back-up facilities are as essential as adequately trained surgeons.

In spite of efforts to rationalise vascular services by the VSS, there is as yet no plan on the organisation of services and training within regions. Ultimately this can only be done by analysing the needs of individual districts and their interrelationships. The changing trends of workload and major differences from expected workload noticed in this study suggest that ongoing audit within individual vascular units is crucial for correct allocation of resources.

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Received 21 December 1989