CHAPTER 13

VASCULAR ACCESS

Kevan Polkinghorne

and

Peter Kerr

The ANZDATA Registry has collected data on vascular access for haemodialysis patients since the 30 September 1999 survey. The type of vascular access in use at each survey collection is recorded as well as any thrombotic or revision events in the six month survey period. The method used for any revision is also recorded (either radiological (angioplasty) or surgical revision).

There are three main aims of this analysis. Firstly to determine the proportion of native fistulas in use at the first haemodialysis treatment for each new patient. Secondly to identify factors associated with an increased use of arterio-venous grafts (AVG) and central venous catheters. Finally, we also sought to identify any differences in vascular access use at a state level.

As vascular access at first dialysis is not specifically collected by ANZDATA we sought to obtain an estimate of this by classifying patients according to their duration on dialysis at each survey period. We then selected all the new patients from the last five survey periods and then estimated the access in fistula use by grouping the patients according to the duration on dialysis.

Figure 13.1

Percentage Synthetic Fistulae/Grafts March 2002
(Number of Patients)

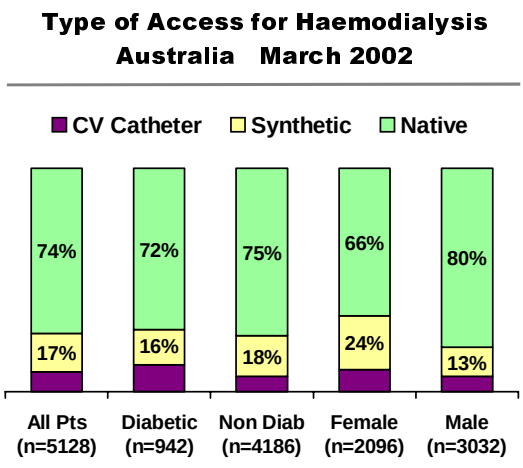
		Diabetic		Non Diabetic	
Queensland	* (784)	19.1%	(162)	14.7%	(622)
New South Wales	(1628)	25.8%	(224)	27.7%	(1404)
Aust. Capital Territory	(117)	46.6%	(15)	41.1%	(102)
Victoria	(1452)	9.2%	(260)	10.4%	(1192)
Tasmania	(106)	4.5%	(22)	4.7%	(84)
South Australia	(363)	13.5%	(59)	9.2%	(304)
Northern Territory	(182)	8.3%	(72)	4.5%	(110)
Western Australia	(496)	14%	(128)	14.1%	(368)
Australia	**(5128)**	**16.2%**	**(942)**	**17.5%**	**(4186)**
* Data unavailable for 10 patients					
New Zealand	**(761)**	**17.5%**	**(240)**	**16.1%**	**(521)**

Figure 13.2

Percentage of Non Native Access
n = Number of Patients

	Australia (n=5138)		New Zealand (n=761)	
	Grafts	Catheters	Grafts	Catheters
Total HD Population	17.3%	8.3%	16.5%	19.1%
Diabetics	16.2%	11.2%	17.5%	28.3%
Female	24.2%	10.2%	27.0%	24.3%

Figure 13.3



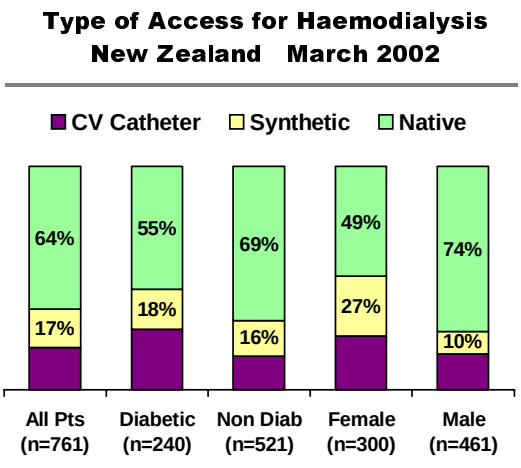


Figure 13.4

Access Intervention in Previous Six Months

n = Number of Patients

		Revision of Access			Declotting of Access		
		Native	Grafts	Catheters	Native	Grafts	Catheters
Australia	**n=5128**	**7.9%**	**21.6%**	**23.7%**	**3.4%**	**16.7%**	**21.8%**
Diabetics	n=942	8.4%	24.8%	26.4%	3.2%	21.5%	22.6%
Female	n=2096	9.3%	19.6%	26.1%	3.3%	14.3%	24.2%
New Zealand	**n=761**	**4.7%**	**17.6%**	**6.5%**	**3.4%**	**15.2%**	**9.5%**

Figure 13.5

From the graph we can see that of the patients who were on dialysis <30 days at their first survey entry, only 45% were dialysing with a native fistula, with a similar using a catheter. The proportion of fistulae increases up until >90 days where it remains much the same as the >180 days group.

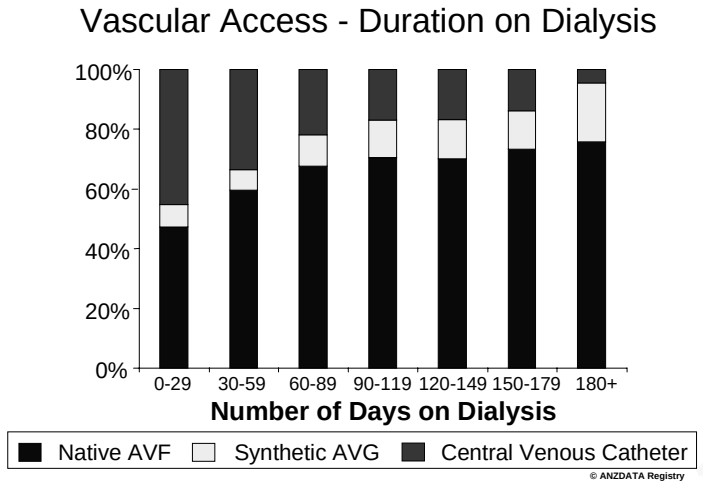
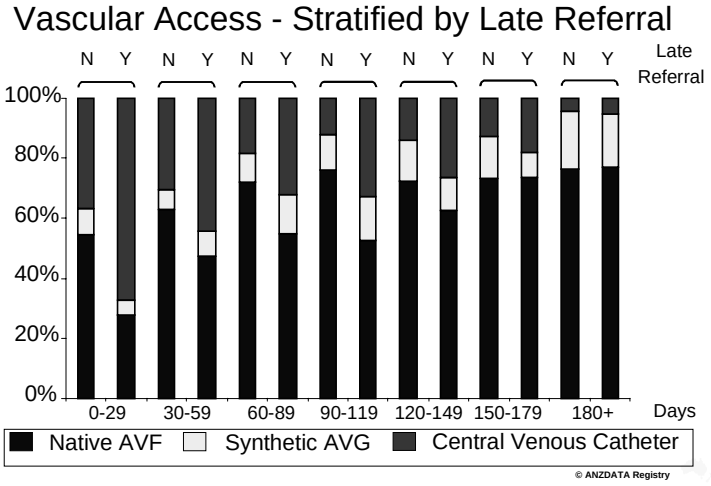


Figure 13.6

This graph demonstrates the profound effect of late referral on the proportion of patients using a native fistula at their first treatment. Only 25% of those patients referred late had a functioning native fistula, with the vast majority using a central venous catheter. The proportion of patients using native fistulae in the late referral group does not reach the same level as the chronic patients until >150 days after starting dialysis.



Vascular Access - Prevalence

- 4978 adult patients on Haemodialysis at 30 September 2001
- Access in Use:
  - Native AVF 3567 (75.5%)
  - Synthetic AVG 872 (18.5%)
  - Catheter 287 (6.0%)
- Patients on dialysis <90 days were excluded

Figure 13.7

To assess factors which may be associated with an increased risk of AVG or catheter use we used the 30 September 2001 survey which consisted of 4978 adult patients (Australian data only). Overall 75.5% dialysed with a native fistula, 18.5% with a AVG and 6% with a central venous catheter. For this analysis patients on dialysis less than 90 days were excluded.

Demographics - AVG versus AVF

Demographic		AVG			
		RR	95% CI	aRR*	95% CI
Female		2.25	1.93-2.61	2.09	1.76-2.49
Age (RR/10yrs)		1.10	1.06-1.17	1.26	1.18-1.35
BMI:	< 20 kg/m^2	1.18	0.93-1.50	0.97	0.75-1.25
	25 - 29.9 kg/m^2	1.00	0.83-1.21	1.04	0.85-1.28
	30 - 34.9 kg/m^2	1.64	1.29-2.09	1.71	1.32-2.23
	≥ 35 kg/m^2	1.64	1.20-2.25	1.78	1.26-2.50
Time on Dialysis (RR/yr)		1.05	1.03-1.06	1.10	1.07-1.12
Late Referral		0.92	0.76-1.11	N/A	N/A

* Adjusted for gender, age, time on dialysis, BMI, hypertension, CAD, PVD, CVD, diabetes, smoking.

Figure 13.8

Addressing AVG first we can see that female gender, age, a BMI >30 and a longer duration on dialysis were independently associated with an increased rate of graft use compared to native fistulae.

Co-morbidities - AVG versus AVF

Co-morbidity		AVG			
		RR	95% CI	aRR*	95% CI
Hypertension		0.68	0.56-0.83	0.69	0.56-0.86
CAD		1.34	1.15-1.56	1.02	0.84-1.24
PVD		1.55	1.34-1.80	1.24	1.02-1.51
CVD		1.55	1.30-1.85	1.38	1.12-1.69
Diabetes:	Type I	1.42	0.95-2.12	1.96	1.24-3.11
	Type II	1.10	0.93-1.31	0.96	0.78-1.18
Smoking:	Current	0.61	0.48-0.79	0.80	0.61-1.06
	Former	0.77	0.65-0.91	0.88	0.73-1.06

* Adjusted for gender, age, time on dialysis, BMI, hypertension, CAD, PVD, CVD, diabetes, smoking

Figure 13.9

Of the various patient co-morbidities, only peripheral vascular disease (PVD), cerebrovascular disease (CVD) and type I diabetes mellitus were independent associated with increased graft use. Patients with a diagnosis of hypertension at treatment start were more likely to receive a fistula than a graft. Coronary artery disease (CAD) was associated with a increased risk on univariate analysis but was not significant in the final model.

Figure 13.10

In contrast to AVG, only female gender was associated with an increased rate of catheter use. As would be expected, a longer duration on dialysis was associated with a reduced frequency of catheter use.

Demographics - Catheter versus AVF

Demographic	Catheter			
	RR	95% CI	aRR*	95% CI
Female	1.82	1.43-2.33	1.94	1.47-2.54
Age (RR/10yrs)	1.10	1.06-1.17	1.03	0.93-1.14
BMI: <20 kg/m^2	0.97	0.66-1.44	0.85	0.56-1.28
25-29.9 kg/m^2	0.81	0.60-1.11	0.81	0.58-1.11
30-34.9 kg/m^2	0.91	0.58-1.43	0.79	0.49-1.28
≥35 kg/m^2	1.55	0.96-2.52	1.15	0.69-1.94
Time on Dialysis (RR/yr)	0.93	0.90-0.97	0.87	0.82-0.93
Late Referral	1.19	0.89-1.60	1.08	0.79-1.46

* Adjusted for gender, age, time on dialysis, late referral, diabetes, CAD, PVD, CVD, BMI, smoking, hypertension

Figure 13.11

Like AVG, PVD, CVD and type I diabetes mellitus were independently associated with increased rates of catheters use. Additionally current smokers also had a higher risk of catheter use compared to native fistulae.

Co-morbidities - Catheter versus AVF

Co-morbidity	Catheter			
	RR	95% CI	aRR*	95% CI
Hypertension	0.88	0.62-1.24	0.80	0.56-1.16
CAD	1.24	0.95-1.61	0.88	0.64-1.21
PVD	1.84	1.40-2.41	1.63	1.18-2.25
CVD	1.67	1.22-2.28	1.36	0.99-1.89
Diabetes: Type I	2.47	1.44-4.22	2.20	1.22-3.96
Type II	1.41	1.08-1.86	1.02	0.74-1.40
Smoking: Current	1.32	0.93-1.88	1.52	1.03-2.24
Former	1.11	0.85-1.46	1.15	0.85-1.55

* Adjusted for gender, age, time on dialysis, late referral, diabetes, CAD, PVD, CVD, BMI, smoking, hypertension

Figure 13.12

At a state level, there was no difference in the rate of late referral compared to NSW/ACT for the majority of the states except Victoria which had a significantly lower rate of late referral and the Northern Territory which has a higher proportion of patients referred less than 3 months before the start of treatment.

Late Referral According to State

State	Late Referral	
	RR	95% CI
NSW/ACT	1.00	-
Victoria	0.77	0.64-0.93
Queensland	1.17	0.95-1.45
South Australia	1.19	0.89-1.58
Western Australia	1.03	0.81-1.32
Tasmania	1.16	0.70-1.93
Northern Territory	1.74	1.24-2.44

Location - AVG versus AVF

State	AVG			
	RR	95% CI	aRR*	95% CI
NSW/ACT	1.00	-	1.00	-
Victoria	0.23	0.19-0.29	0.21	0.17-0.27
Queensland	0.49	0.39-0.61	0.43	0.33-0.56
South Australia	0.14	0.09-0.23	0.13	0.08-0.22
Western Australia	0.37	0.28-0.49	0.37	0.27-0.50
Tasmania	0.05	0.01-0.22	0.05	0.01-0.19
Northern Territory	0.17	0.10-0.31	0.20	0.11-0.36

* Adjusted for gender, age, time on dialysis, late referral, diabetes, CAD, PVD, CVD, BMI, smoking, hypertension

Figure 13.13

The prevalence of AVG use varied significantly according to patient location even after adjustment for patient demographics and co-morbidity. Using NSW and the ACT as the comparison state (they have the largest number of patients) all other states had a significantly lower rate of AVG use.

Location - Catheter versus AVF

State	Catheter			
	RR	95% CI	aRR*	95% CI
NSW/ACT	1.00	-	1.00	-
Victoria	1.18	0.81-1.60	1.18	0.81-1.70
Queensland	1.09	0.71-1.66	1.14	0.73-1.78
South Australia	0.41	0.19-0.91	0.43	0.19-0.96
Western Australia	3.04	2.11-4.38	3.08	2.08-4.55
Tasmania	1.90	0.91-3.97	1.58	0.74-3.40
Northern Territory	0.62	0.26-1.45	0.52	0.21-1.26

* Adjusted for gender, age, time on dialysis, hypertension, CAD, CVD, PVD, late referral, diabetes, smoking, BMI

Figure 13.14

Compared to NSW/ACT catheter was similar in Victoria, Queensland and Tasmania. Both South Australia and the Northern Territory has a lower rate of catheter use although this was only significant for South Australia. Western Australia catheter use was three times higher than NSW/ACT.

Declotting and Revision Risk*

Access Type	Declotting		Revision	
	RR	95% CI	RR	95% CI
AVF	1.00	-	1.00	-
AVG	6.10	4.71-7.90	3.69	3.03-4.51
Catheter	8.81	6.28-12.37	3.88	2.87-5.24

* For the 6 month period 30 March - 31 September 2001

Figure 13.15

As would be expected both AVG and catheters had significantly higher rates of thrombosis and revisions compared to native fistulas.

Summary

In summary, only 50% of new patients had a functioning native fistula, with the overall rate similar after approximately 90 days on treatment. Late referral is an important factor and its effect persists for up to 150 days post treatment.

Female gender, age BMI>30, PVD, CVD and type I diabetes mellitus were all independently associated with increased rates of AVG use, whereas only female gender, PVD, CVD and type I diabetes mellitus were associated with higher rates of catheter use compared to native fistulae.

There were significant regional differences in the rates of AVG and Catheter use, which could not be explained by differences in co-morbidity or referral patterns. These differences may reflect differences in surgical practice and other factors that could not be controlled for in this analysis.