

Association between initial vascular access and survival in hemodialysis according to age

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Background/Aims

This study aims to demonstrate whether the association between initial vascular access and mortality among hemodialysis patients varies by age.

METHODS

We conducted a retrospective study that included 2,552 patients who started hemodialysis. Of the initial sample, 507 patients who did not survive the first 3 months after initiation of hemodialysis were excluded. Vascular access was divided into three categories: percutaneous catheter, tunneled cuffed catheter, and arteriovenous (AV) access.

RESULTS

Figure 1. Outline of the study design. AV access—arteriovenous access

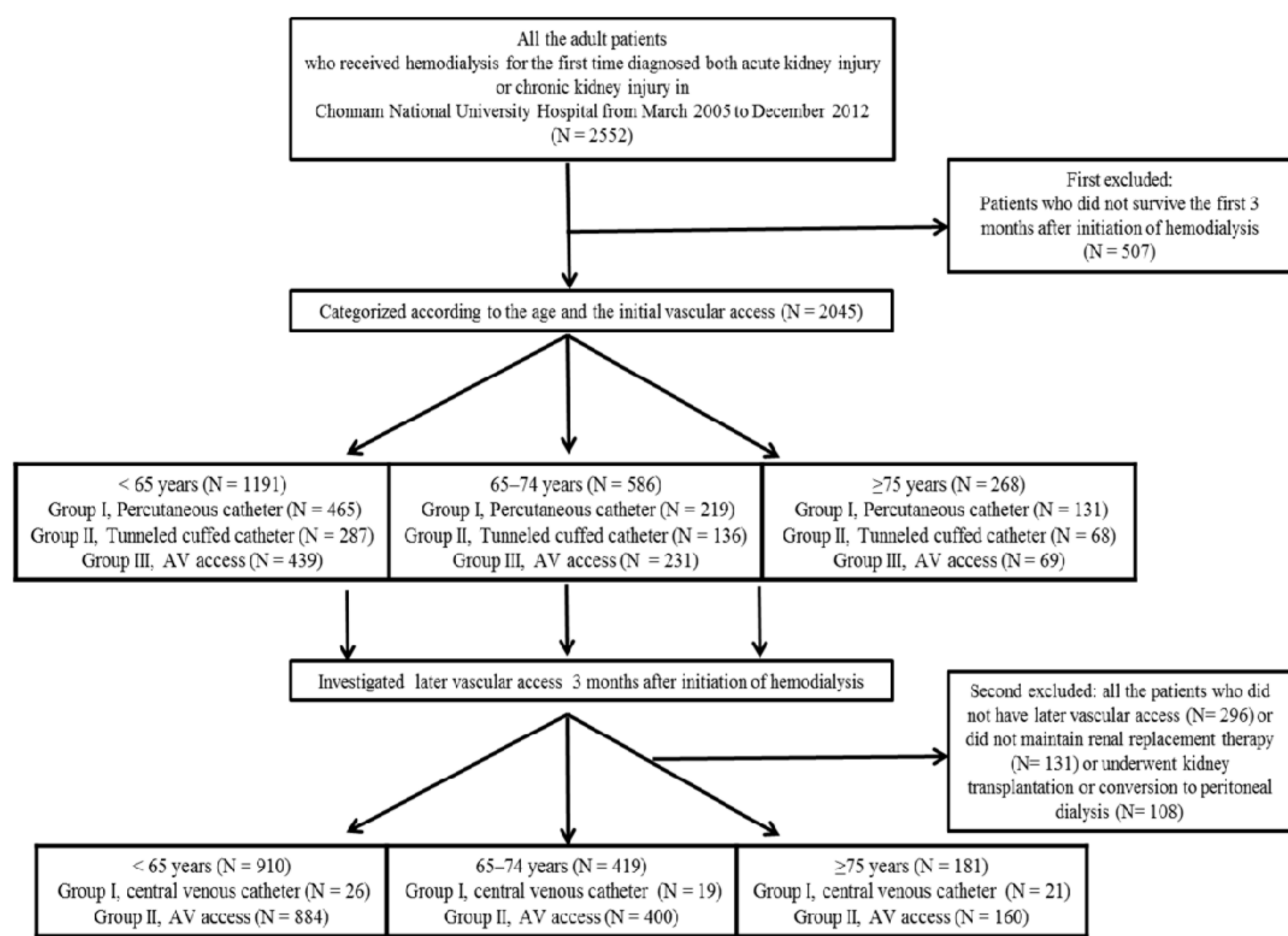


Table 1. Baseline characteristics and clinical features of patients at the time of hemodialysis initiation by vascular access type

	Percutaneous catheter (n = 815)	Tunneled cuffed catheter (n = 491)	AV access (n = 739)	P
Age (y)	58.5 ± 14.5	59.0 ± 15.6	59.4 ± 12.5	0.397
Men (%)	1206 (59.0%)	265 (54.0%)	464 (62.9%)	0.008
BMI (kg/m ²)	23.1 ± 6.64	23.4 ± 8.67	22.6 ± 5.38	0.056
White blood cell (x10 ³ /mm ³)	9.6 ± 5.88	11.1 ± 6.81	8.5 ± 4.61	<0.001
C-reactive protein (mg/dl)	4.8 ± 7.76	5.9 ± 8.81	4.0 ± 6.89	<0.001
Hypertension	1587 (77.6%)	575 (70.6%)	384 (78.2%)	<0.001
Diabetes	1034 (50.6%)	393 (48.2%)	392 (53.0%)	0.164
Heart failure	61 (3.0%)	31 (3.8%)	17 (2.3%)	0.194
Hemoglobin (g/dl)	9.6 ± 2.35	9.4 ± 2.73	10.2 ± 1.92	<0.001
Albumin (mg/dl)	3.3 ± 1.02	3.1 ± 1.27	3.5 ± 0.83	<0.001

Figure 2. Kaplan-Meier survival analysis according to initial vascular access for the three age categories

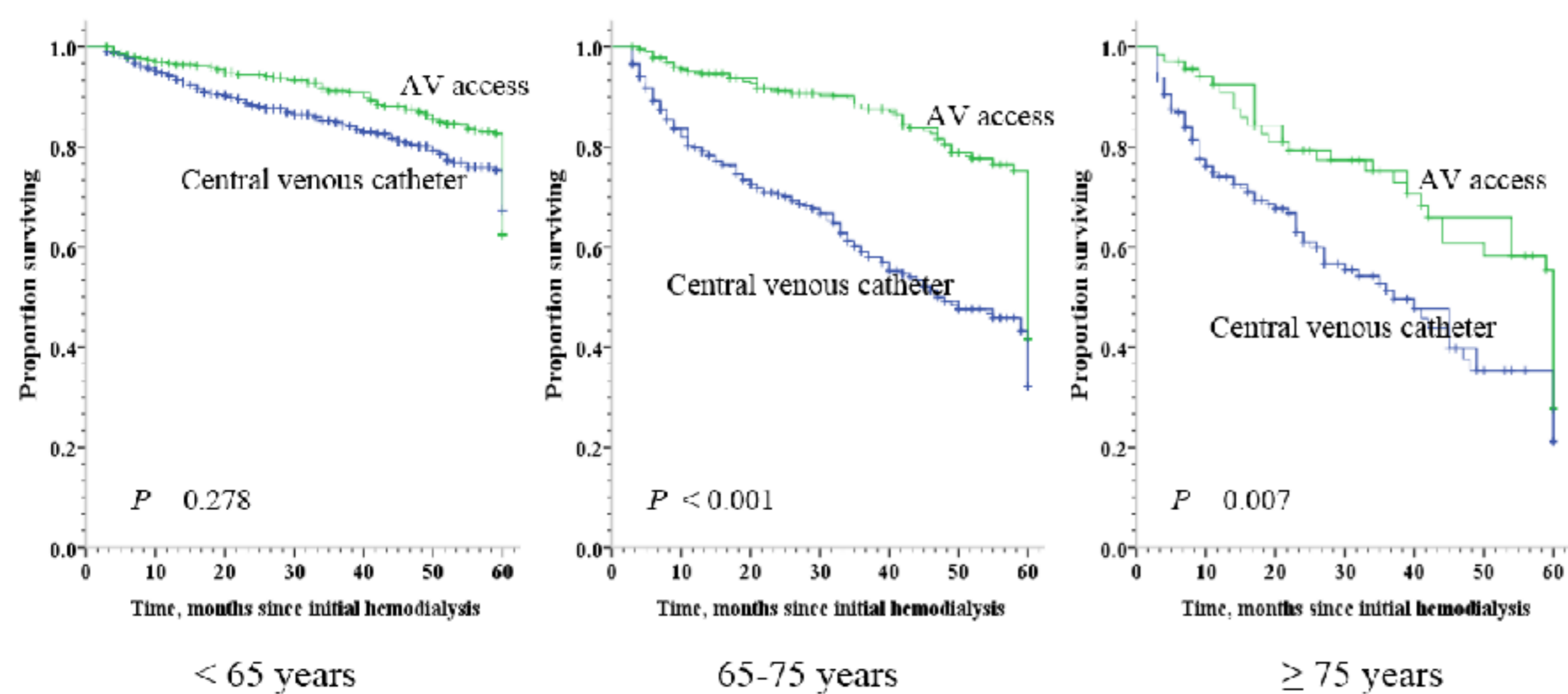


Table 2. Baseline characteristics and clinical features of patients according to age category

	< 65 years (n = 1191)	65-74 years (n = 586)	≥75 years (n = 268)	P
Age (y)	49.6 ± 11.05	69.3 ± 2.80	79.0 ± 3.53	<0.001
Men (%)	783 (61.3%)	336 (56.0%)	153 (54.8%)	0.031
BMI (kg/m ²)	23.2 ± 7.83	23.0 ± 3.74	22.3 ± 3.79	0.205
Late referral	603 (47.3%)	277 (46.2%)	153 (54.8%)	0.070
Past History				
Hypertension	944 (74.0%)	503 (83.7%)	231 (82.8%)	<0.001
Diabetes	599 (47.0%)	375 (62.4%)	117 (41.9%)	<0.001
Heart failure	31 (2.4%)	18 (3.0%)	14 (5.0%)	0.067
Access type				
Percutaneous catheter	465 (39.0%)	219 (37.4%)	131 (48.9%)	0.001
Tunneled cuffed catheter	287 (24.1%)	136 (23.2%)	68 (25.4%)	0.001
AV access	439 (36.9%)	231 (39.4%)	69 (25.7%)	0.001
Conversion rate	94.1%	90.5%	80.3%	<0.001
Chemistry Profile				
Hemoglobin (g/dl)	9.5 ± 2.51	9.6 ± 2.04	9.4 ± 2.14	0.710
Albumin (mg/dl)	3.3 ± 1.19	3.3 ± 0.64	3.2 ± 0.60	0.091
Serum creatinine	9.0 ± 6.49	7.0 ± 3.49	6.2 ± 3.43	<0.001

Table 3. Cox proportional analysis for 5-year mortality by initial vascular access for hemodialysis

		< 65 years		65-74 years		≥75 years	
		HR (95% CI)	P	HR (95% CI)	P	HR (95% CI)	P
Percutaneous catheter	Unadjusted	1.18 (0.89-1.56)	0.226	2.43 (1.82-3.23)	<0.001	2.78 (1.92-4.03)	<0.001
	(1) Adjusted for age	1.26 (0.95-1.66)	0.096	2.41 (1.81-3.21)	<0.001	2.72 (1.88-3.95)	<0.001
	(2) Model 1 plus sex	1.27 (0.96-1.68)	0.087	2.43 (1.82-3.23)	<0.001	2.74 (1.89-3.97)	<0.001
	(3) Model 2 plus diabetes, Heart failure	1.27 (0.96-1.67)	0.091	2.44 (1.83-3.25)	<0.001	2.74 (1.89-3.98)	<0.001
	(4) Model 3 plus cardio-protective medication	1.25 (0.94-1.66)	0.111	2.44 (1.83-3.25)	<0.001	2.77 (1.90-4.03)	<0.001
	(5) Model 4 plus albumin < 3.5 mg/dL	1.10 (0.82-1.46)	0.519	2.29 (1.72-3.06)	<0.001	2.51 (1.72-3.69)	<0.001
Tunneled cuffed catheter	Unadjusted	1.28 (0.92-1.78)	0.134	2.27 (1.64-3.13)	<0.001	1.92 (1.23-2.98)	<0.001
	(1) Adjusted for age	0.90 (0.70-1.16)	0.424	2.27 (1.64-3.13)	<0.001	1.89 (1.21-2.94)	<0.001
	(2) Model 1 plus sex	1.46 (1.05-2.04)	0.024	2.32 (1.68-3.20)	<0.001	1.91 (1.22-2.98)	<0.001
	(3) Model 2 plus diabetes, Heart failure	1.48 (1.06-2.07)	0.019	2.30 (1.66-3.17)	<0.001	1.91 (1.23-2.98)	<0.001
	(4) Model 3 plus cardio-protective medication	1.46 (1.05-2.04)	0.025	2.25 (1.62-3.11)	<0.001	1.95 (1.25-3.05)	0.003
	(5) Model 4 plus albumin < 3.5 mg/dL	1.10 (0.82-1.46)	0.080	2.25 (1.62-3.11)	<0.001	1.89 (1.21-2.96)	0.005
AV access	Unadjusted	1.31 (0.93-1.85)	0.115	2.24 (1.61-3.11)	<0.001	1.96 (1.25-3.07)	0.003

HR- hazard ratio, CI- Confidence interval, cardio-protective medication means one of following: beta-blocker, calcium channel blocker, angiotensin converting enzyme inhibitor, angiotensin receptor antagonist medication

Figure 3. The proportion of vascular access type comparing early referrals and late referrals for the three age categories

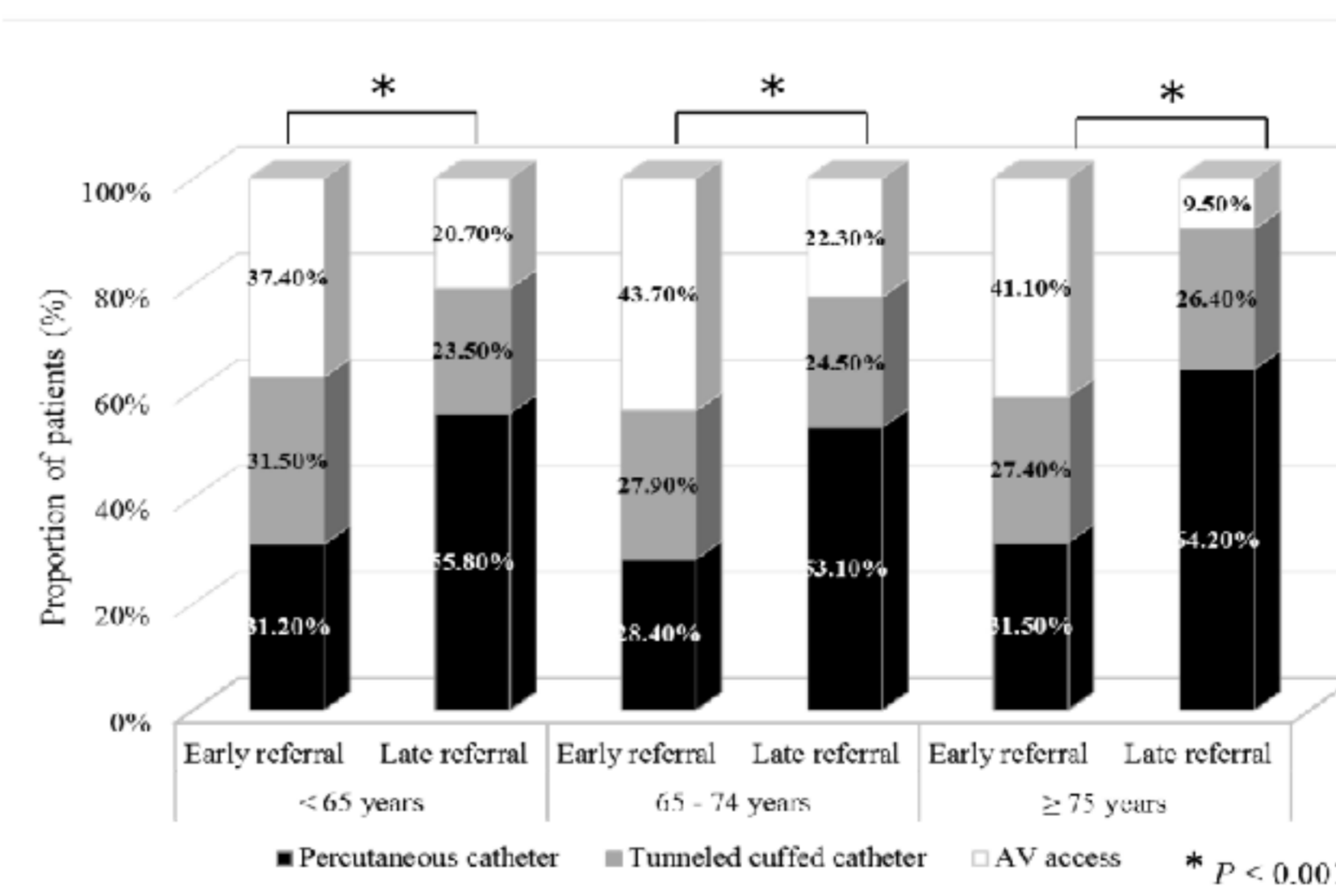
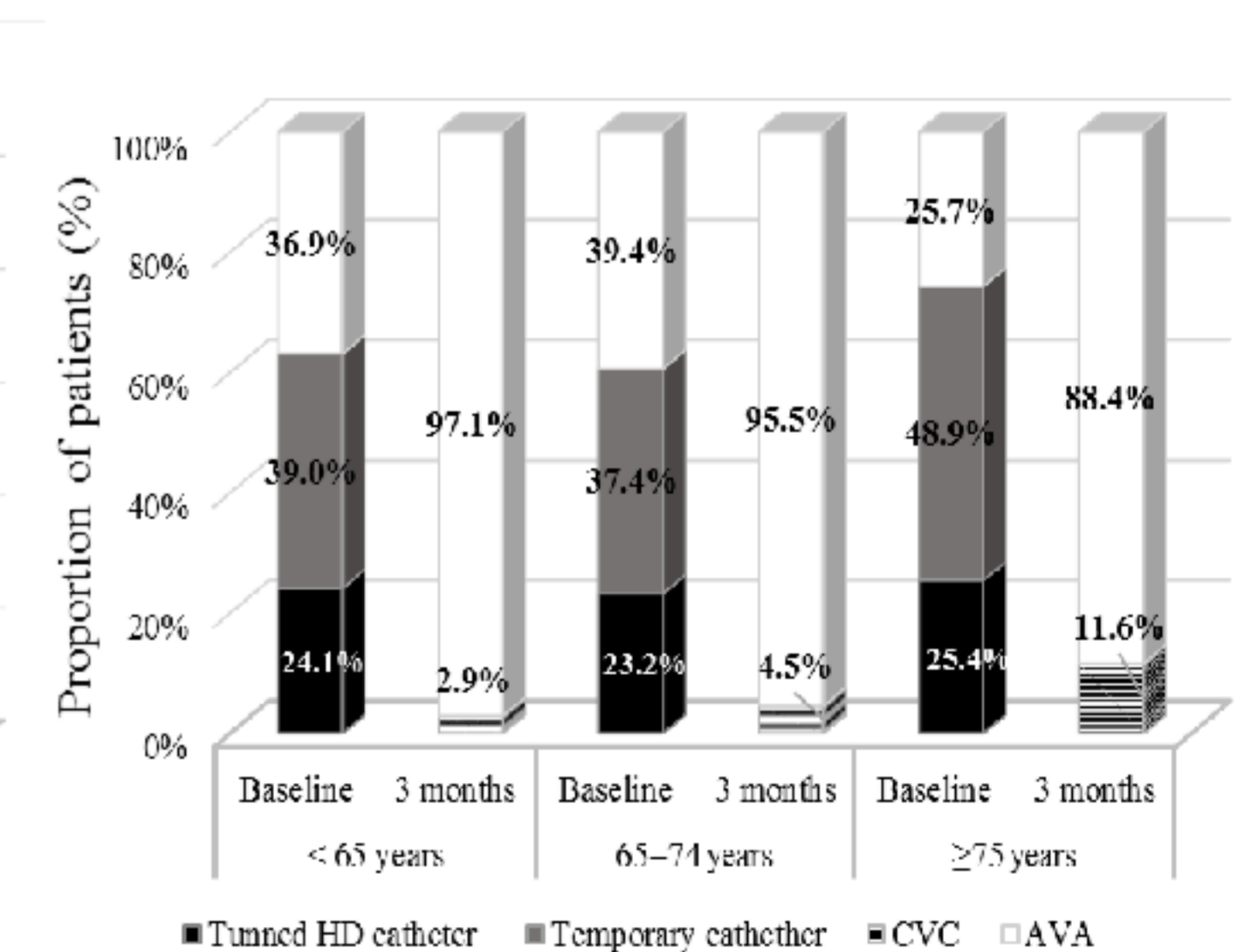


Figure 4. The proportion of vascular access type at baseline and 3 months after hemodialysis initiation for the three age categories



CONCLUSIONS

In patients aged <65 years, if conversion from central venous catheter to AV access was performed properly, initial vascular access was not associated with long-term mortality. "Fistula first" remains a superior strategy for elderly patients and demonstrates it is desirable to change AV access, not maintain the initial central venous catheter.