

## Elderly Age Associated With Poor Functional Outcome After Rupture of Anterior Communicating Artery Aneurysms Lorenzo Rinaldo MD, PhD; Giuseppe Lanzino MD

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# Learning Objectives

To determine the effect of old age on patient outcomes after rupture of anterior communicating artery aneurysms

## Introduction

Increasing age is known to be a risk factor for poor functional outcome after aneurysmal subarachnoid hemorrhage (1). The effect of age on patient outcomes specifically after rupture of anterior communicating artery (Acom) aneurysms is less welldefined.

### Methods

We performed retrospective cohort study on patients presenting to our institution with aneurysmal subarachnoid hemorrhage (aSAH) secondary to a ruptured Acom aneurysm between the years of 2003 and 2012. Patients were divided into two groups on the basis of age, with patients 65 years and older categorized as the elderly group. The effect of age on patient outcomes was then evaluated using multivariate logistic regression analysis. There were 147 patients that presented to our institution with a ruptured Acom aneurysm. Of these patients, 41 (27.9%) were 65 years or older. Patients in the elderly group were more likely to be female (68.3% vs 40.6%, p = 0.0026), and less likely to be active smokers (22.0% vs 60.4%, p = <0.0001) or to abuse alcohol (7.3% vs 21.7%, p = 0.0404). Elderly patients were more likely to have a history of hypertension (70.7% vs 52.8%, p =0.0487) and coronary artery disease (19.5% vs 2.8%, p = 0.0006). Elderly patients were more likely to require a ventriculostomy (61.0% vs 37.7%, p = 0.0109) and ultimately to require permanent CSF diversion (36.6% vs 17.0%, p = 0.0106). On adjusted analysis, age greater than 65 was associated with a greater likelihood of poor outcome at last follow-up within one year of aSAH (OR 3.76, 95% CI 1.30-11.78, p = 0.0144).

Results

ABLE 1. Patient characteristics and clinical outcomes by age ≥65				
Variable	Age <65 (a=106)	Age ≥65 (n=41)	Total (n=147)	P-value
Age, Maan (SD)	50.6 (8.2)	73.7 (5.9)	57.0 (12.9)	
Range	(27-64)	(66-89)	(27-89)	
Gender, N (%)				
Male	63 (59.4)	13 (31.7)	76 (51.7)	
Female	43 (40.6)	28 (68.3)	71 (483)	0.0026
Smoking History				
No	32 (30.2)	25 (61.0)	57 (38.8)	
Yes	74 (69.8)	16 (39.0)	90 (61.2)	0.0006
Current Smoker				
No	42 (39.6)	32 (78.0)	74 (50.3)	
Yes	64 (60.4)	9 (22.0)	73 (49.7)	<0,000
Family History of SAH	10 million (1997)			
140	99 (93.4)	37 (90.2)	136 (92.5)	
Yes	7(6.6)	4 (9.8)	11 (7.5)	0.5148
Hypertension	10 (17 7)	12 (20.7)	(3(133))	
NO You	50 (47.2)	12(29.3)	02 (42.2)	
Ics	20 (27.8)	23(10.1)	45 (57.8)	0.0487
Diabeles				
No	97 (91.5)	37 (90.2)	134 (91.2)	
Tes	A(12)	+ (3.8)	13 (8.8)	0,8085
Coronary Artery Disease	103 (97.3)	77 (80.5)	174 (02.5)	
Var	3(38)	1000	11 (7.5)	0.0004
Alashal Abase	3(2.0)	. (17.5)	11 (6.3)	0.0000
Na	\$7.CTV T)	78 (02 7)	131 (83 7)	
Vet	73 (21.7)	3(72)	26 (12.7)	0.0101
Tes	23 (21.7)	3(73)	20 (17.7)	0.0404
1-3	75 (70 5)	25 (61.0)	100 (68 0)	
4-5	31 (29.2)	16 (39.0)	47 (32.0)	0 7547
Modified Fisher Score	sector al	in (arra)	al (seal)	
1-2	24 (22.6)	9 (22.0)	33 (22.5)	
3-4	\$2 (77.4)	37 (78.0)	114 (77.5)	0.9283
Intracerebral Hemorrhoon		setting)	114(13.3)	0.7440
No	\$3 (78.3)	32 (78.1)	115 (78.2)	
Yes	23 (21.7)	9 (21.9)	32 (21.8)	0.9734
Intraventricular Hemoryhage	the factory			
No	63 (59.4)	18 (43.9)	81 (55.1)	
Yes	43 (40.6)	23 (56.1)	66 (44.9)	0.0895
Aneurysm Size (mm)	66 (3.5)	5.5 (3.6)	63 (3.6)	0.0879
External Ventricular Drainage				
No	66 (62.3)	16 (39.0)	82 (55.8)	
Yes	40 (37.7)	25 (61.0)	65 (44.2)	0.0105
Treatment Modality				
Medical	7 (6.6)	4 (9.8)	11 (7.5)	
Coiling	65 (61.3)	30 (73.2)	95 (64.6)	
Clipping	34 (32.1)	7 (17.1)	41 (27.9)	0.1808
Angiographic Vasospasm				
No	47 (54.7)	24 (80.0)	71 (61.2)	
Yes	39 (453)	6 (20.0)	45 (38.8)	0.0142

Variable	Age <65 (n=106)	Age ≥65 (n=41)	Total (a=147)	P-value
Symptomatic Vasospasm				
No	56 (65.1)	23 (76.7)	79 (68.1)	
Yes	30 (34.9)	7 (23.3)	37 (31.9)	0.2425
Delayed Cerebral Ischemia				
No	68 (64.8)	31 (77.5)	99 (68.3)	
Yes	37 (35.2)	9 (22.5)	46 (31.7)	0.1407
Infarction				
No	68 (64.2)	28 (68.3)	96 (65.3)	
Yes	38 (35.8)	13 (31.7)	51 (34.7)	0.6361
Shant Requirement				
No	88 (83.0)	26 (63.4)	114 (77.6)	
Yes	18 (17.0)	15 (36.6)	33 (22.5)	0.0106
Modified Rankin Scale				
0-2	84 (79.3)	24 (58.5)	108 (73.5)	
3-6	22 (20.8)	17 (41 5)	39 (26 5)	0.0105
TABLE 1 (cont'd). Patient cha	racteristics and clinical or	stcomes by age ≥65	57 (203)	
TABLE 1 (cont'd) Patient cha Variable	ractoristics and clinical or Age <65 (n=106)	atcomes by age 265 Age 265 (n=41)	Total (a=147)	P-value
TABLE 1 (cont'd): Patient cha Variable Symptomatic Vasospasm	ractoristics and clinical or Age <65 (n=106)	shomes by age ≥65 Age ≥65 (n=41)	Total (n=147)	P-value
TABLE 1 (cont'd). Patient cha Variable Symptomatic Vasospasm No	racteristics and clinical or Age <65 (n=106) 56 (65.1)	utcomes by age ≥65 Age ≥65 (n=41) 23 (76.7)	Total (a=147) 79 (68.1)	P-value
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TABLE I (cont'd). Patient cha Variable Symptomatic Vasospasm No Yes Delayod Cerebral Ischemia	Age <65 (n=106) 56 (65.1) 30 (34.9)	17 (412) atcomes by age ≥65 Age ≥65 (n=41) 23 (76.7) 7 (23.3)	Total (n=147) 79 (68.1) 37 (31.9)	P-value 0.2425
TABLE 1 (cont'd): Patient cha Variable Symptomatic Vasospasm No Yes Dolayod Corebral Ischemia No	ractoristics and clinical or Age <65 (n=106) 56 (65.1) 30 (34.9) 68 (64.8)	xicomes by age ≥65 Age ≥65 (n=41) 23 (76.7) 7 (23.3) 31 (77.5)	Total (s=147) 79 (68.1) 37 (31.9) 99 (68.3)	P-value 0.2425
TABLE 1 (cont'd). Patient cha Variable Symptomatic Vasospasm No Yes Delayod Cerebral Ischemia No Yes	racteristics and clinical on Age <65 (n=106) 56 (65.1) 30 (34.9) 68 (64.8) 37 (35.2)	11(412) utcomes by age ≥65 Age ≥65 (n=41) 23 (76 7) 7 (23 3) 31 (77 5) 9 (22 5)	Total (s=147) 79 (68.1) 37 (31.9) 99 (68.3) 46 (31.7)	P-value 0.2425 0.1407
TABLE 1 (cont'd) Patient cha Variable Symptomatic Vasospasm No Yes Delayed Corebral Ischemia No Yes Infarction	racteristics and clinical or Age <65 (a=106) 56 (65.1) 30 (34.9) 68 (64.8) 37 (35.2)	Age 265 (n=41) 23 (76.7) 7 (23.3) 31 (77.5) 9 (22.5)	Total (a=147) 79 (68.1) 37 (319) 99 (68.3) 46 (31.7)	P-value 0.2425 0.1407
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TABLE 1 (cont'd) Patient cha Variable Symptomatic Vasospasm No Yes Delayof Cerobral Ischemia No Yes Infarction No Yes	ractoristics and clinical or Age <65 (s=106) 56 (65.1) 30 (74.9) 68 (64.8) 37 (35.2) 68 (64.2) 38 (55.8)	Age 265 (n=41) 23 (76.7) 7 (23.3) 31 (77.5) 9 (22.5) 28 (68.3) 13 (31.7)	Total (n=147) 79 (68.1) 37 (31.9) 99 (68.3) 46 (31.7) 96 (65.3) 51 (34.7)	P-value 0.2425 0.1407 0.6361
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TABLE 1 (cont'd) Patient cha Variable Symptomatic Vascapasm No Voyod Cerebral Ischemia Veri Infarction No Yes Shant Requirement No Yes	ractoristics and clinical or Age <65 (a=106) 56 (65.1) 30 (34.9) 68 (64.8) 37 (5.2) 68 (64.2) 38 (55.8) 88 (83.0) 18 (17.0)	sicones by age 265 Age 265 (m=41) 23 (76 7) 7 (23 3) 31 (77 5) 9 (22 5) 28 (68 3) 13 (31 7) 26 (63 4) 15 (36 6)	Total (s=147) 79 (68.1) 37 (31.9) 99 (68.3) 46 (31.7) 96 (65.3) 51 (34.7) 114 (77.6) 33 (22.5)	P-value 0.2425 0.1407 0.6361 0.0106
TABLE 1 (cont'd) Patient cha Variable Symptomatic Vascopasm No Delayd Corebral Ischemia No Yes Islancicon No Yes Shant Requerement No Yes Modifor Rankin Scale	ractoristics and clinical or Age <65 (a=106) 56 (65.1) 30 (24.9) 68 (64.8) 37 (35.2) 68 (64.2) 38 (35.8) 88 (63.0) 18 (17.0)	23 (76.7) 7 (23.3) 31 (77.5) 9 (22.5) 24 (68.3) 13 (17.7) 26 (63.4) 15 (26.6)	Total (n=147) 79 (68.1) 37 (319) 99 (68.3) 46 (31.7) 96 (65.3) 51 (34.7) 114 (77.6) 33 (22.5)	P-value 0.2425 0.1407 0.6361 0.0106
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#### Table 2

 Variable Colling
 OR (95% CI)
 P-Value

 Age 265
 2.24 (0.90-602)
 0.0724

Univariate logistic regression analysis indicating likelihood of treatment with endovascular coiling

Table 2

 
 TABLE 2. Univariate logistic regression analysis indicating likelihood of treatment with enforeaccular onling
 OR (25% CI)
 P-Value

 Variable
 OR (25% CI)
 P-Value
 Age 265
 2.24 (0.95.62)
 0.0724

mRS >2)	TABLE 3. Univariate logistic regression analysis indicating likelihood of poor functiona (mRS >2)				
Variable	OR (95% CI)	P-Value			
lge >65	2.70 (1.24-5.92)	0.0129			
iender					
Male	0.85 (0.41-1.77)	0.6637			
Female	1.18 (0.56-2.46)	0.6637			
noking History	1.02 (0.48-2.19)	0.9626			
arrent Smoker	1.09 (0.52-2.28)	0.8131			
amily History of SAH	1.04 (0.22-3.83)	0.9539			
ypertension	0.92 (0.44-1.95)	0.8350			
habetes Mellitus	1.04 (0.22-3.66)	0.9548			
ceonary Artery Disease	1.33 (0.28-4.91)	0.6964			
icohol Abuse	1.02 (0.37-2.58)	0.9602			
/FNS 4 - 5	8 29 (3.73-19.34)	<0.0001			
odified Fisher 3 - 4	7,45 (2.10-47.52)	0.0005			
tracerebral Hemorrhage	3.35 (1.46-7.70)	0.0046			
traventricular Hemorthage	6.67 (2.96-16.36)	<0.0001			
neurysm Size	1.11(1.00-1.24)*	0.0506			
xternal Ventricular Drainage	2.26 (1.08-4.83)	0.0307			
reatment Modality	and a second				
Coiling	0.57 (0.19-1.45)	0.2475			
Clipping	1.76 (0.69-5.12)	0.2475			
ngiographic Vasospasm	1.56 (0.59-4.07)	0.3630			
imptomatic Vasospasm	3.73 (1.42-10.20)	0.0079			
elayed Cerebral Ischemia	2.71 (1.24-5.91)	0.0120			
farction	3.03 (1.43-6.54)	0.0039			
hunt Requirement	1 27 (0.53-2.94)	0.5810			

Univariate logistic regression analysis indicating likelihood of poor functional outcome (mRS >2)

Table 4

(mRS>2)			
Variable	OR (95% CI)	P-Value	
WFNS 4-5	6.43 (2.50-17.7)	<0.0001	
Intraventricular Hemoerhage	4.56 (1.69-13.38)	0.0024	
Age ≥ 65	3.76 (1.30-11.78)	0.0144	

Multivariable analysis showing independent associations with poor functional outcome (mRS >2)