

# Octogenarians Experience Outcomes Similar to Other Elderly Patients after Surgery for Acute Ascending Aortic Dissections

W Brent Keeling<sup>1,\*</sup>, Bradley G Leshnowar<sup>1</sup>, Edward P Chen<sup>1</sup>, Eric L Sarin<sup>1</sup>, Jose Binongo<sup>2</sup>, Omar M Lattouf<sup>1</sup>, Robert A Guyton<sup>1</sup>, Michael E Halkos<sup>1</sup> and Vinod H Thourani<sup>1</sup>

<sup>1</sup>Division of Cardiothoracic Surgery, Joseph B. Whitehead Department of Surgery, Emory University School of Medicine, Atlanta, Georgia, USA

<sup>2</sup>Department of Biostatistics, Rollins School of Public Health, Emory University School of Medicine, Atlanta, Georgia, USA

\*Corresponding author: W Brent Keeling, 49 Jesse Hill Drive, Atlanta, GA 30303, Tel: (404) 561-0539; Fax: (404) 616-4400; E-mail: [brent.keeling@emory.edu](mailto:brent.keeling@emory.edu)

Received date: 22 Dec 2015; Accepted date: 05 Jan 2016; Published date: 11 Jan 2016.

Citation: Keeling WB, Leshnowar BG, Chen EP, Sarin EL, Binongo J, et al. (2016) Octogenarians Experience Outcomes Similar to Other Elderly Patients after Surgery for Acute Ascending Aortic Dissections. *J Surg Open Access* 2(1): doi <http://dx.doi.org/10.16966/2470-0991.112>

Copyright: © 2016 Keeling WB, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

## Abstract

**Introduction:** Acute ascending aortic dissection (AAAD) is a potentially lethal disease that affects elderly patients with some frequency. The purpose of this study was to evaluate the short- and mid-term outcomes of elderly patients following surgery for AAAD.

**Methods:** A retrospective review of the local STS database of patients  $\geq 60$  years of age who underwent surgery for AAAD from 2003-2013 at a US academic center was performed (n=311). Patients were compared based on age groups: 60-69 years (n=183), 70-79 years (n=95) and 80-89 years (n=33). Additionally, chart review based on ICD-9 codes was undertaken to evaluate medically managed patients during the same timeframe. The Social Security Death Index was accessed for survival data. Unadjusted outcomes were compared, and mid-term survival was calculated using Kaplan-Meier curves.

**Results:** Octogenarians had comparable preoperative risk profiles compared to other elderly patients excepting lower body mass index (p=0.006) and underwent similar operations with no difference in concomitant coronary artery bypass grafting (p=0.19), cardiopulmonary bypass time (p=0.75), or aortic cross clamp time (p=0.71). In-hospital mortality rates by age group showed no statistical difference (p=0.69): 60-69 (18.0%), 70-79 (20.0%), and 80-89 (24.2%). There were no survivors in the group of octogenarians who underwent medical management only (0/2, p=0.07). Additionally, rates of postoperative stroke (p=0.73), renal failure (p=0.55), and myocardial infarction (p=0.49) were similar across age groups. Postoperative transfusion requirements were lower in octogenarians: 60-69 (82.0%), 70-79 (84.2%), 80-89 (72.7%) [p=0.34]. Mean 5-year survival was 62.3% for 60-69, 56.7% for 70-79, and 52.2% for 80-89. Mid-term survival was similar across all age groups (p=0.63).

**Conclusion:** Most octogenarians can safely undergo surgery for repair of AAAD with no difference in short-term outcomes compared to other elderly patients. Short-term survival for octogenarians compares favorably to previously published results, and mid-term survival is similar to other elderly patients.

## Introduction

Acute ascending aortic dissections (AAAD) represent potentially life-threatening illnesses with a high rate of morbidity and mortality [1-4]. Historical mortality rates average 50 percent within the first 48 hours from onset. Mortality usually results from intra-pericardial aortic rupture or severe acute aortic valve regurgitation if left untreated. The preferred treatment option for eligible patients remains timely surgical intervention [4]. Even under optimal circumstances, data collected at multiple centers of excellence demonstrates an in-hospital mortality rate of 24% [2].

Some patients who present with AAAD are denied operative intervention based on multiple pre-existing comorbidities and undergo medical management. Best medical management strategies include negative chronotropes and strict blood pressure control [5]. As the general population ages, however, surgical intervention is increasingly being offered to older patients. In prior data from the IRAD (International Registry for Aortic Dissections) researchers, 51 octogenarians experienced an in-hospital mortality rate of 36% following surgical repair for AAAD [4]. This rate of survival was not significantly different from those octogenarians who underwent medical management (p=0.18). A group from Germany detailed the outcomes in octogenarians after surgery for

AAAD from a multi-institutional database [6]. The mortality rate for this group of patients was 35%, but despite the high mortality rate, the authors recommended surgical intervention for AAAD independent of the age of the patient.

The purpose of this research was to investigate the treatment of type A aortic dissections in elderly patients. We hypothesized that few elderly patients underwent medical therapy alone for type A dissections and that outcomes were similar to other elderly patients.

## Methods

### Study design and data collection

A retrospective review of the local STS database of all patients  $\geq 60$  years of age who underwent surgery for AAAD from 2003-2013 at a US academic center was performed (n=311). All patients were included in this analysis. Patients were sorted by age: 60-69 years (n=183), 70-79 years (n=95), and 80-89 years (n=33). Additionally, manual chart review based on primary ICD-9 codes was undertaken to evaluate medically managed patients during the same timeframe (n=2). The Social Security Death Index was accessed for survival data when available. The local Institutional Review Board approved this study.

### Surgical technique

This study spans a long period of time with multiple surgeons involved but, nevertheless, some surgical techniques remained constant. Decisions regarding operative therapy (root replacement, perfusion strategy) were made exclusively by the attending surgeon. For patients all patients, standard cardiopulmonary bypass procedures were followed. Cold antegrade and/or retrograde cardioplegia were routinely utilized at the discretion of the attending surgeon. Typically, conventional cardiopulmonary bypass was performed utilizing roller head pumps, membrane oxygenators, cardiotomy suction, arterial filters, and systemic hypothermia. Current institutional practice includes unilateral selective antegrade cerebral perfusion general, moderate systemic hypothermia (28-30 degrees Centigrade), an open distal anastomosis followed by proximal work, and continuous cerebral oximetry monitoring throughout the duration of the case.

### Statistical analysis

Data were gathered and compiled in a secure database. For quantitative variables, means and standard deviations are presented according to age group. Between group differences were tested using one-way analysis of variance. For categorical variables, counts and proportions are presented according to age group. Between group differences were tested using the chi-square test. Midterm survival was assessed, Kaplan-Meier curves created, and differences were tested using the log rank test. Multivariate regression analysis was omitted given the underlying similarities in preoperative comorbidities among age strata.

### Results

Of the 311 patients included in this study, 33 (10.6%) were octogenarians. Importantly, there was little difference in preoperative characteristics between the three groups of patients (Table 1). The octogenarians who underwent operative therapy for AAAD tended to have lower ejection fractions (p=0.09) but less utilization of preoperative immunosuppressive therapy (p=0.05). Not surprisingly, octogenarians had lower body mass indices than their elderly counterparts (p=0.006).

Table 2 shows that octogenarians also underwent similar operations to the other two age cohorts. Aortic cross clamp and cardiopulmonary bypass times were similar across age groups (p=0.71 and 0.75, respectively). Additionally, octogenarians underwent concomitant CABG at similar

rates to the other elderly patients (p=0.19). Octogenarians underwent similar rates of axillary cannulation and root replacement as compared to the other elderly patients.

Unadjusted postoperative outcomes as listed in Table 3 were similar across age groups. Of note, there was no statistically significant difference in in-hospital mortality (p=0.69). Additionally, transfusion requirements were similar in all age groups (p=0.34).

There were two octogenarians who presented with an acute type A dissection who were medically managed during the study period. Both patients died as a result of their aortic disease in the hospital. In-hospital survival for surgical versus medical therapy for AAAD approached statistical significance (p=0.07).

Mid-term-survival for octogenarians was encouraging (Table 4). 5-year survival was 52.2%, and this did not differ from survival rates of other elderly patients (p=0.63) (Figure 1).

### Discussion

Cooley and colleagues first reported on the surgical repair of aortic dissections in 1956, and since that time, the techniques utilized have continued to evolve [7]. As the safety of operative treatment of AAAD has improved, the range of patients offered therapy has greatly expanded. Recent advances in endovascular therapeutics and cerebral perfusion techniques have allowed for effective treatment of patients with preoperative mesenteric malperfusion as well as preoperative neurologic sequelae of type A dissections [8-10].

In addition to other preoperative comorbidities, advancing patient age continues to be a barrier to some surgeons in terms of operative therapy for AAAD. The IRAD database report on elderly patients published in 2010 failed to definitively conclude that surgical therapy was superior to medical therapy in octogenarians [4]. Additionally, that same manuscript documented a surgical mortality rate of 37.9% for patients aged 80-90. An Italian group demonstrated over 79 consecutive octogenarians a 44.3% in-hospital mortality following surgery for AAAD [11]. Despite the high rate of mortality, the authors concluded that most octogenarians with an uncomplicated type A dissection should undergo surgical repair.

Octogenarians in the current study had a similar preoperative comorbidity profile compared to the other elderly patients. One notable

Characteristic	Age 60-69 N=183	Age 70-79 N=95	Age 80-89 N=33	p-value
Age (mean ± SD)	64.2 ± 3.0	74.1 ± 2.9	82.8 ± 1.9	--
Female gender	61 (33.3)	41 (43.2)	14 (42.4)	0.22
Emergent Status	98 (53.6)	48 (50.5)	17 (51.5)	0.78
Ejection fraction (mean % ± SD)	54.5 ± 10.6	55.6 ± 7.6	49.8 ± 13.4	0.09
Hypertension	175 (95.6)	88 (93.6)	30 (90.9)	0.49
Diabetes	31 (16.9)	14 (14.7)	6 (18.2)	0.86
Preoperative insulin-dependent diabetes	9 (4.9)	4 (4.2)	0 (0.0)	0.43
Moderate or Severe Chronic Lung Disease	16 (8.7)	11 (11.6)	1 (3.0)	0.33
Previous myocardial infarction	32 (17.5)	17 (17.9)	7 (21.2)	0.88
Previous stroke	22 (12.0)	13 (13.7)	1 (3.0)	0.25
Previous Valve Surgery	20 (10.9)	10 (10.5)	2 (6.1)	0.70
Cerebrovascular disease	26 (14.2)	17 (17.9)	2 (6.1)	0.25
Mean preoperative serum creatinine	1.47 ± 1.32	1.37 ± 1.17	1.20 ± 0.45	0.49
Chronic renal insufficiency	17 (9.3)	9 (9.5)	1 (3.0)	0.47
Body Mass Index	28.1 ± 5.9	26.5 ± 5.0	25.4 ± 4.1	0.006
Heart Failure	36 (19.7)	20 (21.1)	9 (27.3)	0.61
Immunosuppressive therapy	15 (8.2)	13 (13.7)	0 (0.0)	0.051

Table 1: Preoperative characteristics

	60-69	70-79	80-89	P Value
Concomitant CABG	25 (13.7)	21 (22.1)	5 (15.2)	0.19
Aortic cross clamp minutes (mean ±SD)	137 ± 70	131 ± 53	129 ± 51	0.71
CPB minutes(mean ±SD)	196 ± 80	191 ± 70	186 ± 74	0.75
Re-do surgery (%)	55 (30.1)	30 (31.6)	5 (15.2)	0.18
Root (%)	60 (32.8)	34 (35.8)	5 (15.2)	0.08
Circulatory Arrest Time (SD)	30.6 ± 26.8	26.6 ± 28.3	17.2 ± 21.6	0.16
Patients transfused (%)	135 (73.8)	73 (76.8)	22 (66.7)	0.52
Mean/median PRBC transfused (%)	6.5 ± 6.3	6.3 ± 5.1	5.1 ± 2.9	0.54
Intraoperative IABP insertion (%)	7 (3.8)	5 (5.3)	3 (9.1)	0.33
Femoral Cannulation	33 (18.0)	15 (15.8)	2 (6.1)	0.23
Axillary Canulation	77 (42.1)	46 (48.4)	16 (48.5)	0.54

**Table 2:** Operative data

Outcome	Age 60-69	Age 70-79	Age 80-89	p-value
	N=183	N=95	N=33	
Postoperative Transfusion	150 (82.0)	80 (84.2)	24 (72.7)	0.34
Septicemia	4 (2.2)	7 (7.4)	1 (3.0)	0.1
Myocardial Infarction	2 (1.1)	0 (0.0)	0 (0.0)	0.49
Stroke	19 (10.4)	10 (10.5)	2 (6.1)	0.73
Postoperative Atrial Fibrillation	60 (32.8)	26 (27.4)	12 (36.4)	0.53
Multi-System Organ Failure	6 (3.3)	4 (4.2)	1 (3.0)	0.91
Pneumonia	28 (15.3)	18 (19.0)	8 (24.2)	0.41
Prolonged Ventilation	101 (55.2)	52 (54.7)	15 (45.5)	0.58
New-onset Dialysis	11 (6.0)	10 (10.5)	0 (0.0)	0.1
Renal Failure	26 (14.2)	16 (16.8)	3 (9.1)	0.55
Reoperation for hemorrhage	18 (9.8)	4 (4.2)	1 (3.0)	0.14
In-hospital mortality	33 (18.0)	19 (20.0)	8 (24.2)	0.69

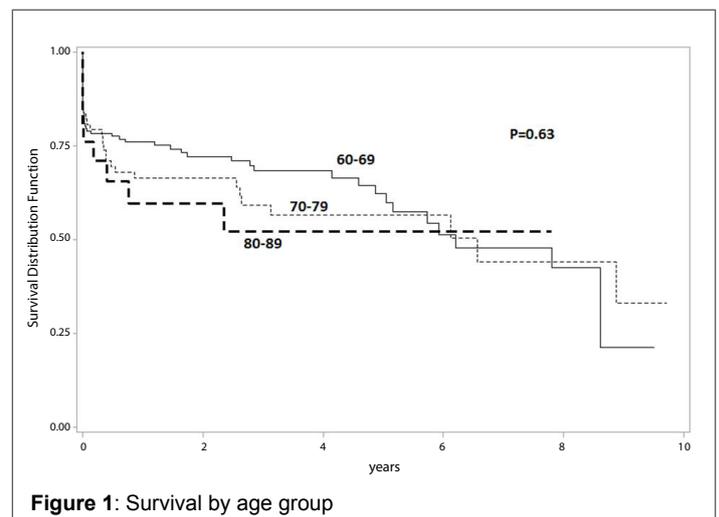
**Table 3:** Unadjusted Outcomes by Age Group

Age Group	1-Year Survival	3-Year Survival	5-Year Survival	P value
60-69	76.1%	68.4%	62.3%	0.63
70-79	66.4%	59.3%	56.7%	
80-89	59.7%	52.2%	52.2%	

**Table 4:** Mid-term survival

exception to this is the lower body mass index seen in octogenarians. Low body mass index has been linked to increased morbidity and mortality following cardiac surgery [12,13]. There is, however, no compelling data regarding body mass index in patients undergoing aortic surgery, and despite the lower body mass indices, octogenarians had similar postoperative outcomes to the other elderly patients.

Octogenarians who underwent medical therapy at our institution over the timeframe of the study were few, thus reflecting our institutional bias toward aggressive surgical management of virtually all patients with AAAD regardless of patient age. A thorough search was made for patients who were managed medically based on primary ICD-9 codes, and over the study period, only two were encountered. Both of these patients died during their subsequent hospitalizations. Octogenarians who underwent medical management of AAAD in the IRAD publication experienced a mortality rate of 55.2% [4]. The number of medically managed patients in this series is small, thus reflecting our institutional bias toward aggressive surgical management for virtually all patients with AAAD.



**Figure 1:** Survival by age group

This study is not without limitations. Given the long period of the study and the many surgeons involved in the treatment of these patients, operative therapies differed, although many efforts have since been made at standardization. As this is a retrospective database driven study, it is subject to the inherent biases and problems in such an endeavor. While every effort was made to capture elderly patients with AAAD who were medically treated by looking at a variety of diagnosis related groups and individual patient charts, it is possible that some patients were not included.

## Conclusion

In conclusion, this data adds to the growing body of work which demonstrates excellent perioperative outcomes in octogenarians who underwent surgical therapy for AAAD. Moreover, it provides data showing good mid-term survival in elderly patients as well, thus confirming our bias toward aggressive surgical management regardless of age.

## References

1. Nienaber CA, Fattori R, Mehta RH, Richartz BM, Evangelista A, et al. (2004) Gender-related differences in acute aortic dissection. *Circulation* 109: 3014-21.
2. Mehta RH, Suzuki T, Hagan PG, Bossone E, Gilon D, et al. (2002) Predicting death in patients with acute type a aortic dissection. *Circulation*. 105: 200-6.
3. Collins JS, Evangelista A, Nienaber CA, Bossone E, Fang J, et al. (2004) Differences in clinical presentation, management, and outcomes of acute type a aortic dissection in patients with and without previous cardiac surgery. *Circulation*. 110: 11237-42.
4. Trimarchi S, Eagle KA, Nienaber CA, Rampoldi V, Jonker FH, et al. (2010) Role of age in acute type A aortic dissection outcome: report from the International Registry of Acute Aortic Dissection (IRAD). *The Journal of thoracic and cardiovascular surgery*. 140: 784-9.
5. Hassan M, Carvalho EM, Macedo FI, Gologorsky E, Salerno TA (2010) Paradigm change in the management of patients with acute type A aortic dissection who had prior cardiac surgery. *Journal of cardiac surgery*. 25: 387-9.
6. Rylski B, Suedkamp M, Beyersdorf F, Nitsch B, Hoffmann I, et al. (2011) Outcome after surgery for acute aortic dissection type A in patients over 70 years: data analysis from the German Registry for Acute Aortic Dissection Type A (GERAADA). *European journal of cardio-thoracic surgery: official journal of the European Association for Cardio-thoracic Surgery*. 40: 435-40.
7. Cooley DA, Creech O, Jr., De Bakey ME (1956) Surgical treatment of dissecting aneurysm. *Journal of the American Medical Association*. 162: 1654-7.
8. Leshnower BG, Veeraswamy RK, Duwayri YM, Chen EP (2014) The "TEVAR-first" approach to DeBakey I aortic dissection with mesenteric malperfusion. *The Annals of thoracic surgery*. 97: 693-6.
9. Comas GM, Leshnower BG, Halkos ME, Thourani VH, Puskas JD, et al. (2013) Acute type a dissection: impact of antegrade cerebral perfusion under moderate hypothermia. *The Annals of thoracic surgery*. 96: 2135-41.
10. Most H, Reinhard B, Gahl B, Englberger L, Kadner A, Weber A, et al. (2015) Is surgery in acute aortic dissection type A still contraindicated in the presence of preoperative neurological symptoms? *Eur J Cardiothorac Surg*. 48: 945-50.
11. Piccardo A, Le Guyader A, Regesta T, Gariboldi V, Zannis K, et al. (2013) Octogenarians with uncomplicated acute type a aortic dissection benefit from emergency operation. *The Annals of thoracic surgery*. 96: 851-6.
12. Thourani VH, Keeling WB, Kilgo PD, Puskas JD, Lattouf OM, et al. (2011) The impact of body mass index on morbidity and short- and long-term mortality in cardiac valvular surgery. *The Journal of thoracic and cardiovascular surgery*. 142: 1052-61.
13. Keeling WB, Kilgo PD, Puskas JD, Halkos ME, Lattouf OM, et al. (2013) Off-pump coronary artery bypass grafting attenuates morbidity and mortality for patients with low and high body mass index. *The Journal of thoracic and cardiovascular surgery*. 146: 1442-8.