

Received: 2013.01.28
Accepted: 2014.03.06
Published: 2014.05.07

Clinical profiles and outcomes of acute aortic dissection in a predominantly Hispanic population

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

ABCDEF 1 **Haider Alkhateeb**
ABCDEF 1 **Sarmad Said**
ABCDE 1 **Chad J. Cooper**
ABCD 1 **Carlos Rodriguez-Castro**
CD 2 **Alok Dwivedi**
ABCD 1 **Eduardo Onate**
ABC 1 **Raphael Quansah**
ABCDEF 1,3 **Debabrata Mukherjee**

1 Department of Internal Medicine, Paul L. Foster School of Medicine, Texas Tech University Health Sciences Center, El Paso, TX, U.S.A.
2 Department of Biomedical Sciences, Division of Biostatistics and Epidemiology, Paul L. Foster School of Medicine, Texas Tech University Health Sciences Center, El Paso, TX, U.S.A.
3 Division of Cardiovascular Medicine, Paul L. Foster School of Medicine, Texas Tech University Health Sciences Center, El Paso, TX, U.S.A.

Corresponding Author: Sarmad Said, e-mail: sarmad.said@ttuhsc.edu
Source of support: Departmental sources

Background: Acute aortic dissection (AAD) is a life-threatening cardiovascular condition with high morbidity and mortality. We sought to assess clinical profiles as well as outcomes of AAD in a predominantly Hispanic population and to explore the relationship between this condition and uncontrolled/untreated hypertension in this community.

Material/Methods: This was a single-center, retrospective, cross-sectional study of patients admitted with AAD over a 10 years period.

Results: Fifty-nine cases of AAD were included in the analysis. The group of Hispanics with AAD had more females (48.3%, $p=0.002$), more dyslipidemia and coronary artery disease ($p=0.006$ and 0.05 , respectively), and a tendency to be older and have more hypertension and diabetes compared to non-Hispanics. Although 70.2% of all patients had hypertension, only 52.5% of them were being treated; of those, only 66.7% achieved optimal blood pressure control prior to presentation. Only 47.4% received beta-blockers for blood pressure control in the acute setting. Longer length of in-hospital stay was associated with older age, higher troponin and creatine kinase levels, and presence of hypertension. In-hospital death occurred in 10 (17%) patients and mortality was significantly associated with higher serum creatinine ($p=0.01$).

Conclusions: Hispanic patients with AAD were more likely to be female, of older age, and have more cardiovascular risk factors in comparison to non-Hispanics. In addition, significant under-treatment of hypertension in this population and underutilization of beta-blockers for blood pressure control in the acute settings was evident. Better prevention and timely treatment may improve outcomes for this condition in this population.

MeSH Keywords: **Aortic Diseases • Blood Pressure • Dissection • Hispanic Americans**

Full-text PDF: <http://www.medscimonit.com/download/index/idArt/890456>

 1717  2  1  13

Background

The aorta has a complex intrinsic biology and sophisticated mechanical properties; any process that undermines its architecture threatens its structure, stability, and functionality. In this regard, acute aortic dissection (AAD) requires special attention because it is the most catastrophic acute illness of the aorta and, therefore, has become an important topic of recent research.

AAD is part of the acute aortic syndrome [1,2]. It is an age-dependent, life-threatening cardiovascular condition with high morbidity and mortality due to potentially fatal complications [3]. On the basis of autopsy data, AAD is believed to be the most common form of life-threatening aortic pathology [4]. If untreated, AAD has a mortality rate of 33% within the first 24 hours and rises to 50% mortality by the first 48 hours [4]. The mortality rate approaches 75% in patients with undiagnosed ascending AAD by the second week after onset, and after 3 months without appropriate treatment, the mortality rises to 90% [5].

There are many reports on the incidence of AAD in relation to several risk factors [4,6]; however, the true incidence is unknown because an undetermined number of undiagnosed or misdiagnosed cases result in sudden death and do not undergo an autopsy. Population-based studies have estimated the incidence of AAD to be about 3 cases per 100 000 people per year [7]. It is known that 3 out of 1000 patients presenting in the emergency room with chest or back pain, or both, have an aortic dissection. The peak incidence of aortic dissection occurs between the 6th and 7th decades of life at a mean age of 61 years [8]. Geographic differences or international heterogeneity in clinical presentation, diagnostic frequency, and clinical outcomes have been described. Men are more often affected than women (68% vs. 32%) [9].

Investigators of the International Registry of Aortic Dissection (IRAD) previously described the clinical profiles and outcomes of AAD [10], yet no distinction was made regarding ethnicity. Given the growing Hispanic population in the United States, we sought to evaluate the epidemiological factors and outcomes of AAD in a predominantly Hispanic population in a US/Mexico border city and explore the relationship between this condition and uncontrolled/untreated hypertension, as well as the impact of this catastrophic disease in this community.

Material and Methods

Study design

This was a single-center, retrospective, cross-sectional study of patients presenting with AAD to the University Medical Center

(UMC) in El Paso, Texas, USA over a 10-year period. The research protocol was approved by the institutional review board at the UMC of El Paso and Texas Tech University Health Sciences Center and the requirement for informed consent and patient authorization was waived. Research was conducted in compliance with standards set forth in the Declaration of Helsinki.

Study population and procedures

All patients who presented to the UMC of El Paso and received the diagnosis of AAD from December 2002 to December 2012 were included in the study. After patient identification, pharmacy records and hospital electronic medical records were reviewed, and we collected data on demographic and clinical variables and diagnostic and therapeutic procedures undertaken to treat those patients along with complications encountered and final outcomes. We excluded patients if they had chronic aortic dissection, had been immediately transferred to another facility for higher level of care, or received the diagnosis of AAD after autopsy.

Statistical analysis

The continuous variables were summarized using mean and standard deviation or median and interquartile range. Categorical variables were summarized using frequency and proportion. Unpaired t test/Wilcoxon rank sum test was used to compare continuous variables, while categorical variables were compared using Fisher's exact test. A Spearman correlation was computed between continuous variables and hospital length of stay. P-values less than or equal to 0.05 were considered statistically significant. Stata 12.1 was used for statistical analysis.

Results

A total of 60 cases of AAD were identified during the specified time period, 59 cases were included in the analysis, and 1 case was excluded because the type of dissection (acute versus chronic) could not be clarified. The mean age of the patients was 54.7 (range 16–87) years. The median hospital stay was 7 days and the mean body mass index was 30.8 Kg/m². The majority of patients (83.1%) were diagnosed with type B dissection and 16.9% had type A dissection. Ethnicity distribution was 52.5% Hispanic, 37.3% Caucasian, 5.1% African American, and 5.1% Asian. Table 1 describes the baseline characteristics in the entire cohort and compares the differences among Hispanic and non-Hispanic patients.

Females with AAD constituted 48.3% of the Hispanic group in comparison to 10.7% in the non-Hispanics (p=0.002). Hispanic patients with AAD had more coronary artery disease and dyslipidemia in

Table 1. Baseline characteristics of the patients.

Variable	Total Cohort		Hispanic		Non-Hispanic		P-value
Age (years) mean (SD)	54.7	(19.2)	59.16	(19.35)	50.48	(18.32)	0.06
Female gender n (%)	18	(30.5)	15	(48.3)	3	(10.7)	0.002
BMI (Kg/m ²) mean (SD)	30.8	(6.9)	32.15	(7.31)	29.07	(6.17)	0.19
Hospital stay (days)*	7.0	(3–14)	5	(3–10)	7	(2–19)	0.22
HTN n (%)	40	(70.2)	24	(80.0)	16	(57.1)	0.15
Diabetes n (%)	19	(33.3)	13	(43.3)	6	(21.4)	0.16
Dyslipidemia n (%)	19	(33.3)	15	(50.0)	4	(14.3)	0.006
CKD n (%)	16	(28.0)	10	(33.3)	6	(21.4)	0.39
CAD n (%)	8	(14.0)	7	(23.3)	1	(3.6)	0.05
PVD n (%)	3	(5.2)	2	(6.7)	1	(3.6)	1.00
CHF n (%)	10	(17.5)	7	(23.3)	3	(10.7)	0.30
Smoking n (%)	28	(50.0)	16	(53.3)	12	(44.4)	0.78
Cholesterol mean (SD)	152.88	(53.01)	153.35	(37.22)	151.44	(75.22)	0.96
Triglyceride mean (SD)	125.36	(69.6)	144.88	(72.49)	88.22	(40.82)	0.01
LDL mean (SD)	84.9	(31.1)	87.47	(29.96)	80.56	(32.89)	0.59
HDL mean (SD)	37.60	(10.3)	37.88	(10.99)	36.67	(8.86)	0.84
Creatinine*	1.20	(0.8–1.52)	1.05	(0.7–1.52)	1.25	(0.9–1.71)	0.39
Troponin*	0.02	(0.02–0.05)	0.02	(0.02–0.05)	0.02	(0.02–0.16)	0.82
CK*	327.1	(97–201)	136	(50–165)	144	(97–336)	0.14
Dissection Type-B n (%)	49	(83.1)	26	(83.9)	23	(82.1)	1.00

* Median (Interquartile Range); BMI – body mass index; CAD – coronary artery disease; CHF – congestive heart failure; CK – creatine kinase; CKD – chronic kidney disease; HDL – high-density lipoprotein; HTN – hypertension; LDL – low-density lipoprotein; PVD – peripheral vascular disease; SD – standard deviation.

comparison to the non-Hispanics ($p=0.05$ and 0.006 , respectively), with relatively higher triglycerides level ($p=0.01$).

Out of all the patients diagnosed with AAD, 70.2% had hypertension and 52.5% were actually receiving treatment for their hypertension (of those, only 66.7% actually achieved goal control of blood pressure prior to their presentation).

Various diagnostic imaging modalities were used in our center to confirm the diagnosis of AAD, the commonest being CT angiography (Table 2). Review of the medical records showed that blood pressure control in acute settings was achieved using a variety of antihypertensive medications, yet only 47.4% received beta-blockers for blood pressure control. A number of treatment modalities were used, with medical treatment being the commonest (62.1%), followed by surgical treatment (32.8%) and endovascular repair (5.2%) (Figure 1).

Median length of in-hospital stay was longer for the hypertensive patients ($p=0.03$) and those with higher levels of troponin ($r=0.38$, $p=0.02$). Longer in-hospital stay was also found to be correlated with older age ($r=-0.24$, $p=0.07$) and higher creatine kinase levels ($r=0.32$, $p=0.09$), but these correlations did not reach statistical significance.

The all-cause in-hospital mortality was 17%. Among patients who died, 6 had hypertension, 5 were not being treated for hypertension prior to presentation, and the 1 patient who was being treated did not achieve goal control. Furthermore, only 2 of the patients who died actually received beta-blockers for the management of AAD. Patients who died had significantly higher serum creatinine levels as compared to those who survived the AAD ($p=0.03$). A total of 6 deaths were recorded in the non-Hispanic group versus 4 in the Hispanic group.

Table 2. Imaging modalities used for diagnosis of AAD.

Test	n (%)
Trans-thoracic echocardiogram	
Yes	37 (62.71)
No	22 (37.29)
Trans-esophageal echocardiogram	
Yes	11 (18.65)
No	48 (81.35)
Chest X-ray	
Yes	53 (89.83)
No	6 (10.17)
Computed tomography angiogram	
Yes	59 (100.00)
Magnetic resonance angiogram	
Yes	2 (3.39)
No	57 (96.61)

Discussion

Our study provides better understanding of the clinical parameters and outcomes of AAD in a Hispanic population as compared to non-Hispanics; it also helps to identify variables associated with longer in-hospital stay and describes diagnostic and therapeutic modalities used in management. Analysis of data from our study revealed significant differences in gender distribution between the Hispanic and non-Hispanic groups. Females were 48.3% of the Hispanic group, a percentage higher than that described by Neinaber et al. [9], the investigators of the IRAD, where the male: female ratio was 2:1. Furthermore, Hispanic patients had more dyslipidemia and coronary artery disease in comparison to the non-Hispanics. Although not statistically significant, patients in the Hispanic group tended to be older with more diabetes and hypertension as compared to non-Hispanics. All of these cardiovascular risk factors may have contributed to the development of AAD in this population. On the other hand, there was no statistically significant difference between the 2 groups in terms of body mass index, length of in-hospital stay, and type of dissection.

Although the percentage of AAD patients with hypertension in this population (67.8%) was close to that described by the investigators of IRAD [11], only half were actually being treated prior to presentation, mostly due to the socioeconomic

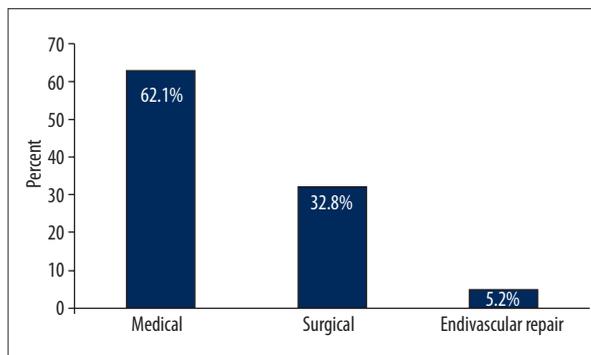


Figure 1. Treatment modalities used for AAD.

barriers that patients have in this community and due to the lack of access to primary medical care. This fact could increase the incidence of AAD in this community and actually increased the length of in-hospital stay. In addition, 50% of the fatalities occurred in AAD patients who had untreated hypertension prior to presentation.

For the initial management of AAD, the guidelines of the European Society of Cardiology recommend lowering the systolic blood pressure to 100–120 mmHg and lowering heart rate to 60 beat/minute using intravenous beta-blockers as first-line drugs to decrease the shear force in the aortic wall [12]. However, our results showed that only 47.4% of our patients received beta-blockers in the acute settings. This under-utilization of beta-blockers may contribute to the morbidity and mortality of AAD in this community. In fact, 80% of patients who died did not receive beta-blockers in the initial management. Additional research is indicated to understand this deviation from evidence-based care.

The all-cause in-hospital mortality in our study was 17% (10 patients), but due to the small sample size, no significant statistical difference between the Hispanics and non-Hispanics was observed. Nonetheless, patients who died had significantly higher serum creatinine levels as compared to those who survived the AAD, which is consistent with the predictors of mortality described by Mehta et al. in the IRAD group [13].

Increasing awareness of possible complications of uncontrolled hypertension in this community is a crucial step to decrease the incidence of cardiovascular adverse events, including AAD. Furthermore, continuous medical education for physicians and other medical personnel is fundamental to keep them updated on the most recent guidelines for the diagnosis and optimal treatment of this catastrophic disease.

Study limitations

The retrospective, observational design of our study has obvious limitations, including missing variables and non-availability

of some important parameters in some of the reviewed charts. Another limitation of this study is the small sample size. The analysis did not include time between symptom onset and patient death or the complications of AAD that patients had. Due to the small number of mortalities and the missing parameters, the multivariate analysis could not be carried out. In the absence of a control group, we could not determine the association between treated and controlled hypertension with AAD or derive the incidence of AAD in this community.

References:

1. Vilacosta I, Roman JA: Acute aortic syndrome. *Heart*, 2001; 85: 365–68
2. Vilacosta I, Aragoncillo P, Canadas V et al: Acute aortic syndrome: A new look at an old conundrum. *Heart*, 2009; 95: 1130–39
3. Parthenakis F, Koutalas E, Patrianakos A et al: Diagnosing acute aortic syndromes: the role of specific biochemical markers. *Int J Cardiol*, 2010; 145: 3–8
4. Clouse WD, Hallett Jr JW, Schaff HV et al: Acute aortic dissection: population-based incidence compared with degenerative aortic aneurysm rupture. *Mayo Clin Proc*, 2004; 79: 176–80
5. Luo F, Zhou XL, Li JJ, Hui RT: Inflammatory response is associated with aortic dissection. *Ageing Res Rev*, 2009; 8: 31–35
6. Boledovičová M, Hendl J, Lišková L et al: Blood pressure relation to body composition and age: analysis of a nurse-led investigation and consultation program. *Med Sci Monit*, 2013; 19: 612–17
7. Golledge J, Eagle KA: Acute aortic dissection. *Lancet*, 2008; 372: 55–66
8. Isselbacher EM: Epidemiology of thoracic aortic aneurysms, aortic dissection, intramural hematoma, and penetrating atherosclerotic ulcers. In: Baliga RR, Nienaber CA, Isselbacher EM, Eagle KA, editors. *Aortic dissection and related syndromes*. New York: Springer Science, 2007; 3–15
9. Nienaber CA, Fattori R, Mehta RH et al: Gender-related differences in acute aortic dissection. *Circulation*, 2004; 109: 3014–21
10. Suzuki T, Mehta RH, Ince H et al: International Registry of Aortic Dissection. Clinical profiles and outcomes of acute type B aortic dissection in the current era: lessons from the International Registry of Aortic Dissection (IRAD). *Circulation*, 2003; 108(Suppl.1): I1312–17
11. Hagan PG, Nienaber CA, Isselbacher EM et al: The International Registry of Acute Aortic Dissection (IRAD): new insights into an old disease. *JAMA*, 2000; 283(7): 897–903
12. Erbel R, Alfonso F, Boileau C et al: Task Force on Aortic Dissection, European Society of Cardiology. Diagnosis and management of aortic dissection. *Eur Heart J*, 2001; 22(18): 1642–81
13. Mehta RH, Suzuki T, Hagan PG et al: International Registry of Acute Aortic Dissection (IRAD) Investigators. Predicting death in patients with acute type A aortic dissection. *Circulation*, 2002; 105(2): 200–6

Conclusions

AAO is a challenging diagnostic and therapeutic dilemma with high rates of morbidity and mortality. The Hispanic population with AAD has a higher percentage of females, with more dyslipidemia and coronary artery disease, in comparison to non-Hispanics, and patients tended to be older, with more hypertension and diabetes. Hypertension as a major risk factor for AAD appears to be under-treated in this population. Increasing awareness to the complications of hypertension, as well as more optimal and timely treatment of hypertension and AAD, is crucial in this population.