Dept. of Cardiothoracic Surgery

Assessing Patient Outcomes in Type-A Aortic Dissection: Identifying Factors Affecting Outcomes

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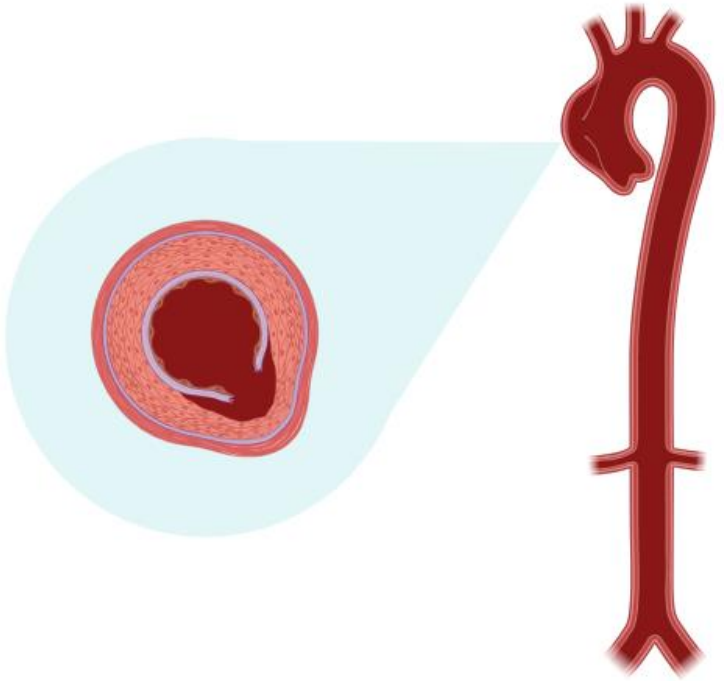
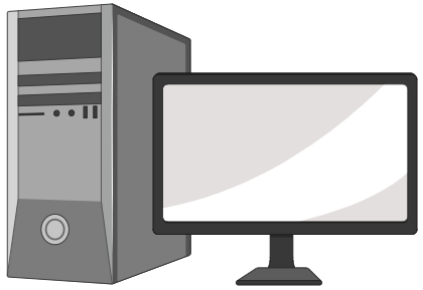
Type-A aortic dissection increases risk of mortality and requires immediate surgical and medical attention



Treatment of Type-A Aortic Dissection

- Surgery is the gold standard and only treatment for acute aortic dissection[1,2]
- Despite this, in-hospital mortality for surgical patients remains high (10-30%)[3,4]
- In addition, some patients are considered prohibitive risk to undergo the surgery
- As such, our goal is to:
    1. Evaluate outcomes of patients presenting with Type-A aortic dissection
    2. Identify patient characteristics associated with better or worse outcomes



Using our institution's EMR, cases over the past 10 years of all patients who presented with Type-A aortic dissection were reviewed and stratified by treatment

Non-Surgical (Medical) Intervention

Surgical Intervention

Overall Patient Demographics

Characteristic	Non-Surgical Patients, N = 50	Surgical Patients, N = 192	p-value
Age at Diagnosis (years)	74 ± 2	61 ± 1	**<0.001**
Sex			**0.003**
Female	27 (54%)	58 (30%)	
Male	23 (46%)	134 (70%)	

Surgical Non-Survivors vs Surgical Survivors
Travel Distance

Characteristic	Died within 30 Days, N = 18	Survived for >30 Days, N = 174	p-value
Total Distance Traveled (miles)			0.4
Mean distance	61 ± 35	76 ± 83	
Median distance	66 (30, 82)	70 (38, 92)	
Total Distance by Group (miles)			0.3
≤ 80	13 (72%)	103 (60%)	
> 80	5 (28%)	70 (40%)	
Transport Method			0.6
Air	9 (50%)	98 (57%)	
Ground	9 (50%)	73 (43%)	
Missing	0	2	

Surgical Non-Survivors vs Surgical Survivors
Comorbidities and Presenting Characteristics

Characteristic	Died within 30 Days, N = 18	Survived for >30 Days, N = 174	p-value
Age at Diagnosis (years)	72 (53, 81)	59 (50, 71)	**0.021**
Sex			0.8
Female	6 (33%)	52 (30%)	
Male	12 (67%)	122 (70%)	
Prior Cardiac Surgery	4 (22%)	8 (4.6%)	**0.017**
Heart Failure	3 (17%)	8 (4.6%)	0.2
Diabetes Mellitus	3 (17%)	12 (6.9%)	0.2
Chronic Kidney Disease	5 (28%)	11 (6.3%)	**0.009**
Anticoagulated			**0.002**
None	10 (56%)	152 (87%)	
Yes	8 (44%)	22 (13%)	
Hemodynamic Instability	6 (33%)	30 (17%)	0.11
Myocardial Infarction at presentation	5 (28%)	15 (8.6%)	**0.026**
Ascending Only	6 (33%)	59 (34%)	>0.9
Ascending & Descending	12 (67%)	115 (66%)	>0.9
Limb Malperfusion	3 (17%)	14 (8.0%)	0.2
Gut Malperfusion	2 (11%)	6 (3.4%)	0.2
Stroke	0 (0%)	9 (5.2%)	>0.9

Surgical Non-Survivors vs Surgical Survivors
Intra- and Post-operative Measures

Characteristic	Died within 30 Days, N = 18	Survived for >30 Days, N = 174	p-value
Intra-Operative			
Hemiarch	13 (72%)	154 (89%)	0.065
Ascending Repair	8 (44%)	82 (47%)	>0.9
Bentall	7 (39%)	52 (30%)	0.4
X-clamp Time (min)	153.8 ± 19.1	121.6 ± 4.3	**<0.001**
Cerebral Perfusion Time (min)	50.1 ± 4.4	36.4 ± 1.7	**0.035**
Received >2 units pRBCs	8 (44%)	38 (22%)	**0.043**
Post-Operative			
Bleeding	8 (44%)	24 (14%)	**0.003**
Cardiogenic Shock	4 (22%)	11 (6.3%)	**0.039**

Non-Surgical Non-Survivors vs Non-Surgical Survivors
Comorbidities and Presenting Characteristics

Characteristic	Died within 30 Days, N = 33	Survived for >30 Days, N = 14	p-value
Age at Diagnosis (years)	73.4 ± 2.2	73.6 ± 2.9	>0.9
Sex			0.053
Female	21 (64%)	4 (29%)	
Male	12 (36%)	10 (71%)	
Heart Failure	8 (24%)	3 (21%)	**0.039**
Prior Cardiac Surgery	7 (22%)	5 (36%)	0.5
Missing	1	0	
Diabetes Mellitus	7 (21%)	2 (14%)	0.7
Chronic Kidney Disease	5 (15%)	1 (7.1%)	0.7
Anticoagulated			0.7
Missing	1 (3.0%)	0 (0%)	
None	21 (64%)	7 (50%)	
Yes	11 (33%)	7 (50%)	
Hemodynamic Instability	13 (39%)	2 (14%)	0.2
Myocardial Infarction	10 (30%)	1 (7.1%)	0.14
Ascending Only	14 (42%)	7 (50%)	0.8
Ascending & Descending	19 (58%)	7 (50%)	0.8
Limb Malperfusion	4 (13%)	1 (5%)	>0.999
Gut Malperfusion	6 (19%)	0 (0%)	0.159
Stroke	13 (42%)	1 (5%)	**0.027**

Results

- Surgical Cohort
  - Patient's age (≥72 years), history of prior cardiac surgery, chronic kidney disease, anticoagulant use, and myocardial infarction at time of presentation were all associated with increased mortality
  - Importantly, distance of transfer from an outside hospital to a tertiary care center (UIHC), did not affect mortality
  - Intraoperatively, shorter X-clamp time (≤121.6±4.3 min) and cerebral perfusion (≤36.4±1.7 min) promoted better survival
  - Post-operative bleeding and patients experiencing cardiogenic shock had increased risk of mortality
- Non-Surgical Cohort
  - History of heart failure and presenting with a stroke increased 30-day mortality risk

Conclusions

- Emergent surgery is a life-saving treatment for Type-A aortic dissection decreasing risk of mortality with excellent outcomes
- Pre-operative comorbidities and post-operative complications of bleeding and cardiogenic shock increase risk of mortality
- Once there is clinical suspicion for Type-A aortic dissection and/or diagnosis is confirmed, patients should be transferred to a tertiary care center for continued care
- Overall, mortality without surgery remains very high

References

1. Jassar, A. S., & Sundt, T. M. (2019). How should we manage type A aortic dissection?. *General thoracic and cardiovascular surgery*, *67*, 137-145.
2. Silaschi, M., Byrne, J., & Wendler, O. (2017). Aortic dissection: medical, interventional and surgical management. *Heart*, *103*(1), 78-87.
3. Tsai, T. T., Evangelista, A., Nienaber, C. A., Trimarchi, S., Sechtem, U., Fattori, R., ... & Eagle, K. A. (2006). Long-term survival in patients presenting with type A acute aortic dissection: insights from the International Registry of Acute Aortic Dissection (IRAD). *Circulation*, *114*(1_supplement), I-350.
4. Piccardo, A., Regesta, T., Zannis, K., Gariboldi, V., Pansini, S., Tapia, M., ... & Caus, T. (2009). Outcomes after surgical treatment for type A acute aortic dissection in octogenarians: a multicenter study. *The Annals of thoracic surgery*, *88*(2), 491-497.