Predictors of Aortic Rupture in Thoracic Aortic Aneurysms

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Background & Aims

- Rupture of aneurysms is a rare but life-threatening complication of thoracic aortic aneurysms (TAA), requiring emergent intervention

- Other than size, there is a paucity of literature on predisposing factors for rupture of TAA

- We sought to identify demographic and clinical predictors of aortic rupture in patients with TAA.

Methods

- A retrospective review of medical records for all patients with the diagnosis of TAA from <u>2010-2020</u> was conducted.

- Patients were stratified into two cohorts: <u>rupture vs no rupture.</u>

- Baseline characteristics, labs at admission, and post-treatment outcomes were compared between the groups.

Methods

- Univariate and multivariate stepwise logistic regression analysis were undertaken to identify statistically significant predictors of rupture.

- Imputation by median was performed If <15% data for any variable were missing.

- Survival was compared between the groups using Kaplan-Meier analysis.

Results

- A total 3902 TAA patients included

  - 3.7% (144/3902) ruptured aneurysms

  - 96.3% (3758/3902) unruptured aneurysms

  - Median age was 71 years (61-80)

Results

- Rupture cohort:
  - Comprised more women (55.6% (80/144) vs. 38.7% (1455/3758), p<0.001)
  - Higher levels of:
    - C-reactive protein (CRP) (15.7mg/L (7.6-22.2) vs. 5mg/L (1.0 vs. 11.8), p=0.003)
    - Neutrophil-lymphocyte ratio (6.3 (3.1-12.6) vs. 4.5 (2.7 vs. 8.2), p=0.016)
    - Serum creatinine (1.06mg/dL (0.9-1.3) vs. 1.0mg/dL (0.8-1.16), p<0.001)
    - Maximum TAA size (5.6cm (4.7-7.0) vs. 4.7cm (4.3-5.4), p<0.001)

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Results

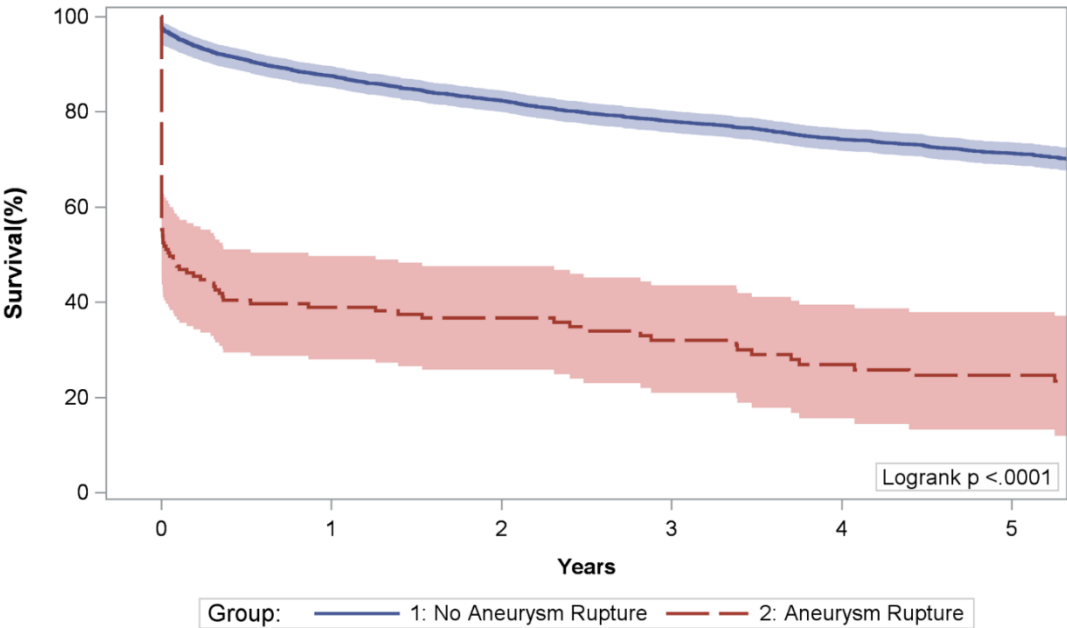| Outcome	No rupture	Rupture	P-Value
In-hospital mortality	88 (2.34%)	62 (43.06%)	<.001
30-day mortality	158 (4.20%)	74 (51.39%)	<.001
Overall mortality	1128 (30.02%)	105 (72.92%)	<.001
Ischemic stroke	239 (6.36%)	23 (15.97%)	0.624
Hemorrhagic stroke	64 (1.70%)	7 (4.86%)	0.566
Major bleeding	653 (17.38%)	70 (48.61%)	0.001
Post-op tracheostomy	16 (0.43%)	8 (5.56%)	<.001
Prolonged mechanical ventilation	81 (2.16%)	19 (13.19%)	<.001
Reintubation	22 (0.59%)	6 (4.17%)	<.001
Dialysis	46 (1.22%)	15 (10.42%)	<.001
Length of stay	3.99 (2.30- 6.00	5.39 (1.71- 11.20	0.01
30-day readmission	479 (12.75%)	23 (15.97%)	0.256
Follow-up duration (years)	3.70 (1.49- 6.90	0.07 (0.00- 2.70	<.001

Comparison of outcomes between rupture and no rupture cohort

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Results

Effect	OR	95% Confidence Limits		p-Value
Female	2.269	1.036	4.971	0.041
BMI	0.968	0.899	1.042	0.383
BSA	3.297	0.470	23.119	0.230
Race (white)	0.475	0.234	0.964	0.039
Current smoker	0.886	0.383	2.050	0.777
Stroke history	1.252	0.533	2.944	0.606
RBC	1.031	0.998	1.064	0.066
Hematocrit	0.917	0.877	0.958	0.000
Platelets	1.002	0.999	1.005	0.223
Creatinine	1.135	0.838	1.538	0.412
Neutrophil-lymphocyte ratio	1.024	1.002	1.047	0.032
Maximum size	1.731	1.457	2.056	<.0001

Multivariable stepwise logistic regression model with backward elimination for risk of aneurysm rupture

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Results

Kaplan-Meier Survival Analysis Comparing ruptured and unruptured cohort

Discussion

- High risk features for aortic rupture in TAA include:
  - **Non-white race**
  - **Female gender**
  - **High Neutrophil-lymphocyte ratios**
  - **High CRP**
  - **Larger maximum aneurysm size**

- Significantly high mortality associated with aneurysm rupture

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Conclusion

❑ Poor outcomes associated with aortic rupture

❑ Further validation of inflammatory markers and patient demographics as predictors of rupture is needed to define high-risk populations and initiate timely interventions.