



# The Natural History of Aortic Arch Aneurysms

## When to Intervene

Aortic LIVE 2017

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2011



2012



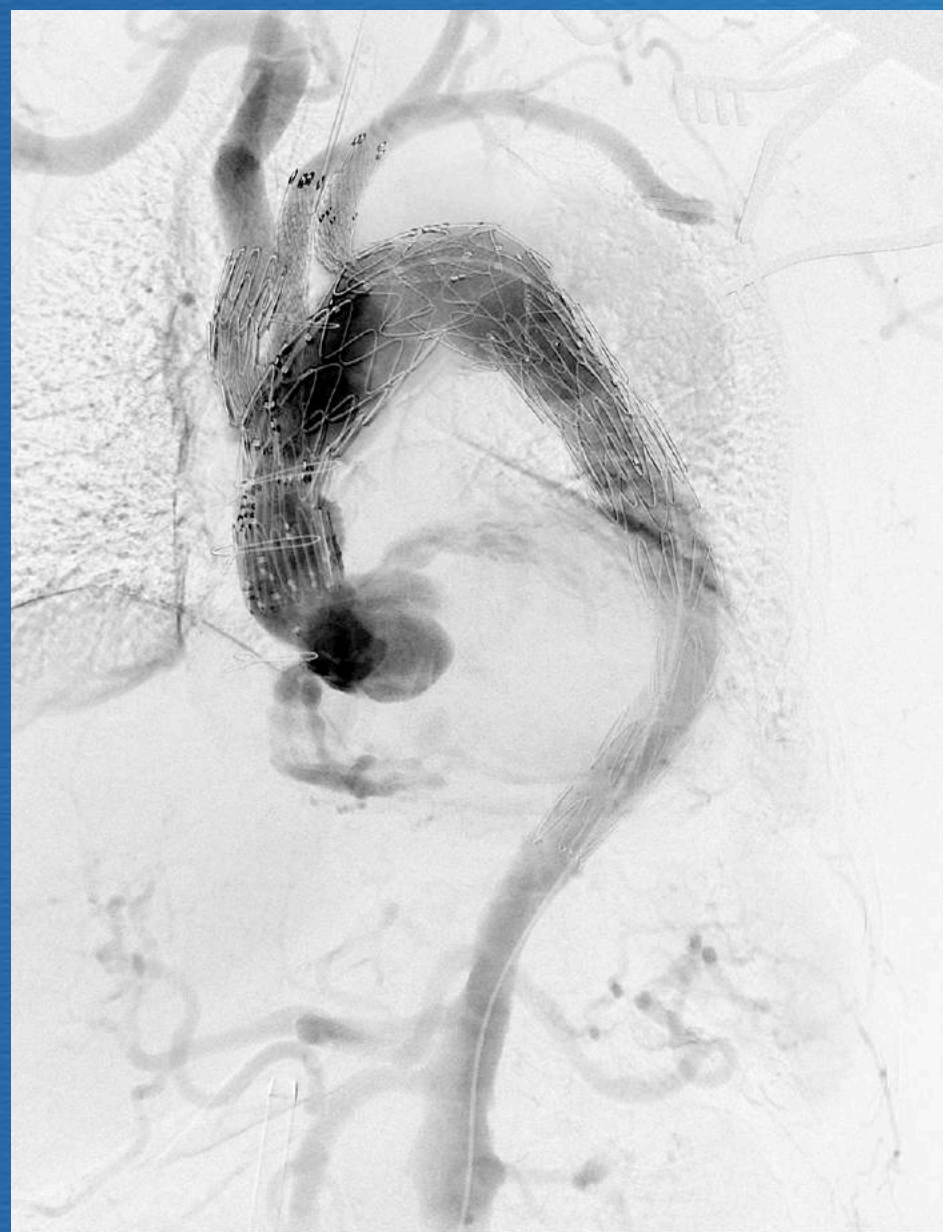
2014













M58  
Ruptured while waiting  
For A-Br graft



M79  
Refused TEVAR  
Ruptured died 4 months



M80  
Refused TEVAR  
Ruptured died



## Objectives

- Determine the natural history of isolated, non-dissecting aortic arch aneurysms
- Identify risk factors of arch aneurysm rupture



Hospital-wide database, n=45

#### EXCLUSION:

Dissections

Thoraco-abdominal

Ascending aneurysms

Marfan

<2 CT follow up



# Patient Characteristics

0  Time

## Demographics

- Age
- Gender
- Smoking
- Hypertension
- Hyperlipidemia
- Chronic heart diseases
- COPD
- Chronic renal diseases
- Diabetes mellitus

## Clinical course

- Surgery
- Rupture
- Death

## Aneurysm

- Size
- Morphology

## Serial CTs

- Aneurysm expansion rate

Fusiform

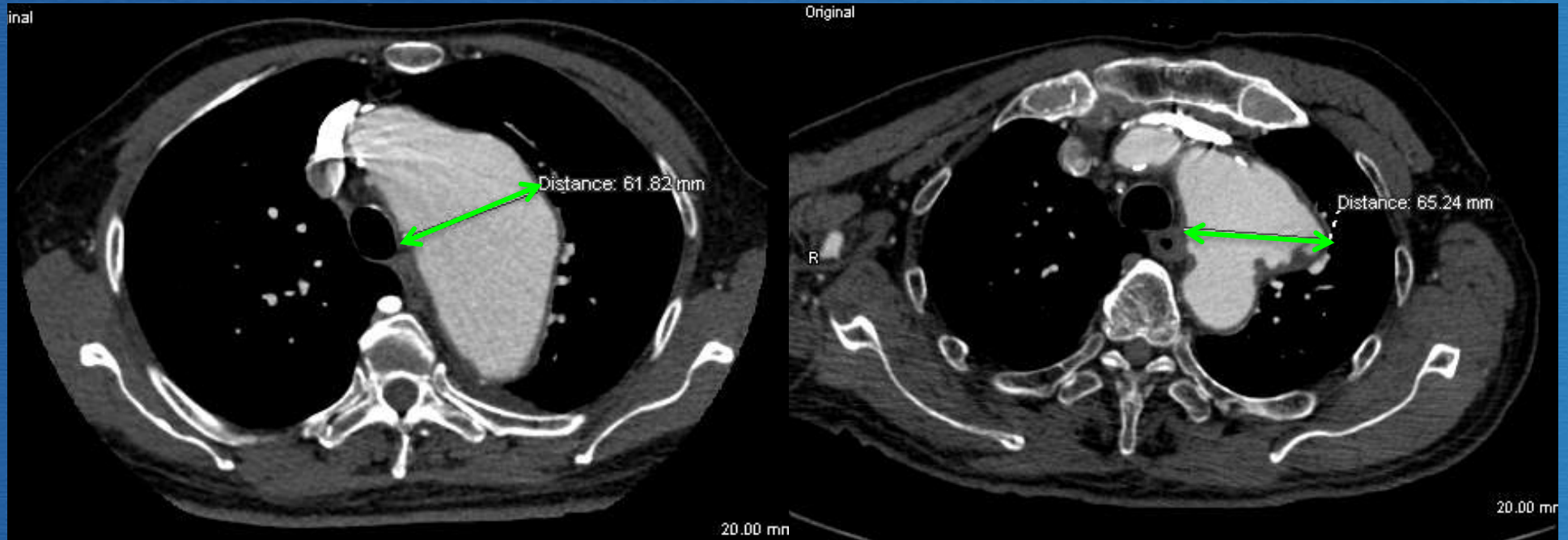


Saccular





## Size: Maximal Transverse Diameter



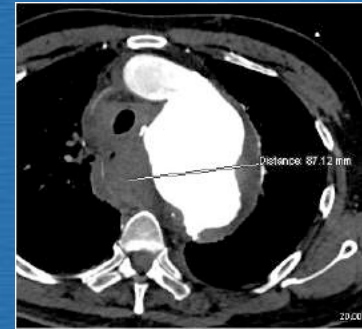
# Aneurysms n=45

- Size:
  - Mean 5.6 cm
  - 3.9-9.9 cm
- Morphology:
  - 23 saccular (51%)
  - 22 fusiform (49%)
- Ascending aorta diameter
  - Mean 4.1 cm
  - 2.7-4.8 cm



## Clinical Course

- Follow up: mean 36.6 months; (191 patient-years)
- 10 ruptures (22%)
  - 9 died; 1 survived
- 4 postponed elective surgery; 2 emergency surgery
- Total deaths= 23 (51%)
  - 9 ruptures; 14 others

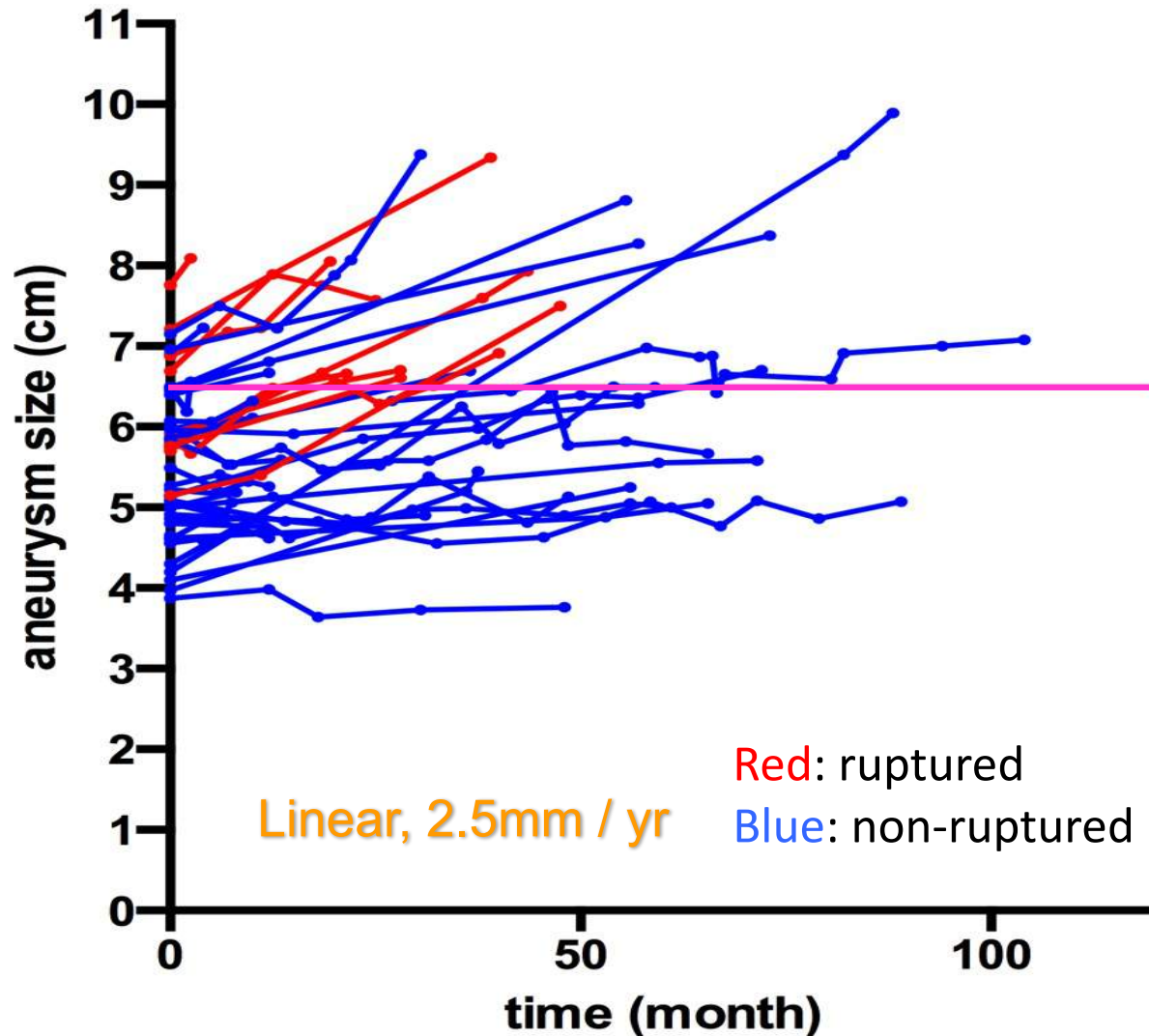


## Demographics: Rupture vs No Rupture

Characteristic	Total (n=45)	Rupture (n=10)	Rupture-Free (n=35)	P Value
Age (y)	77.0 ± .9	77.4 ± 1.9	76.9 ± 1.1	.817
Male	36 (80%)	8 (80%)	28 (80%)	1.000
Current smoker	11 (24.4%)	1 (10%)	10 (28.6%)	.409
Hypertension	32 (71.1%)	7 (70%)	25 (71.4%)	1.000
Hyperlipidemia	15 (33.3%)	3 (30%)	12 (34.3%)	1.000
Coronary artery diseases	27 (60.0%)	6 (60%)	21 (60%)	.721
COPD	13 (28.9%)	3 (30%)	10 (28.6%)	.704
Chronic renal diseases	13 (28.9%)	4 (40%)	9 (25.7%)	.704
Diabetes mellitus	14 (31.1%)	4 (40%)	10 (28.6%)	.428



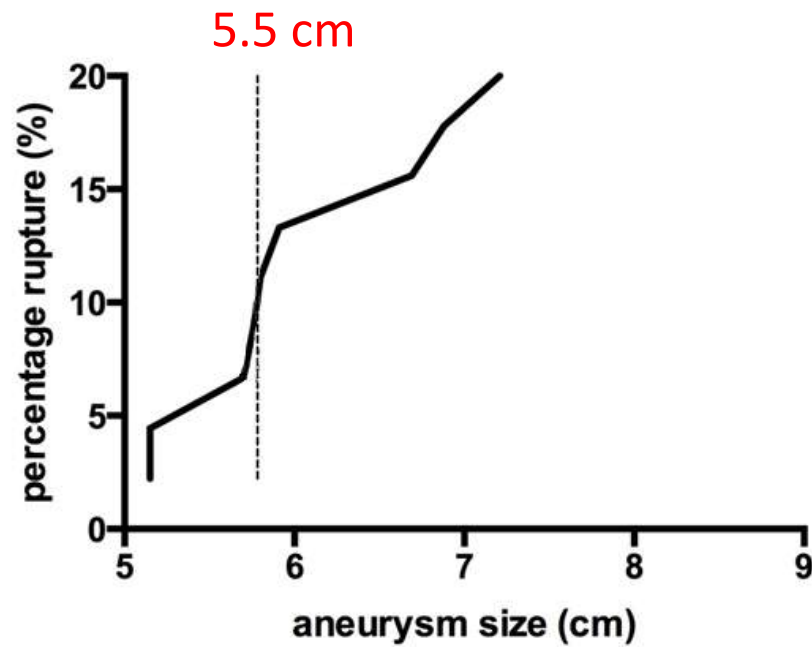
# Aneurysm Expansion Rates



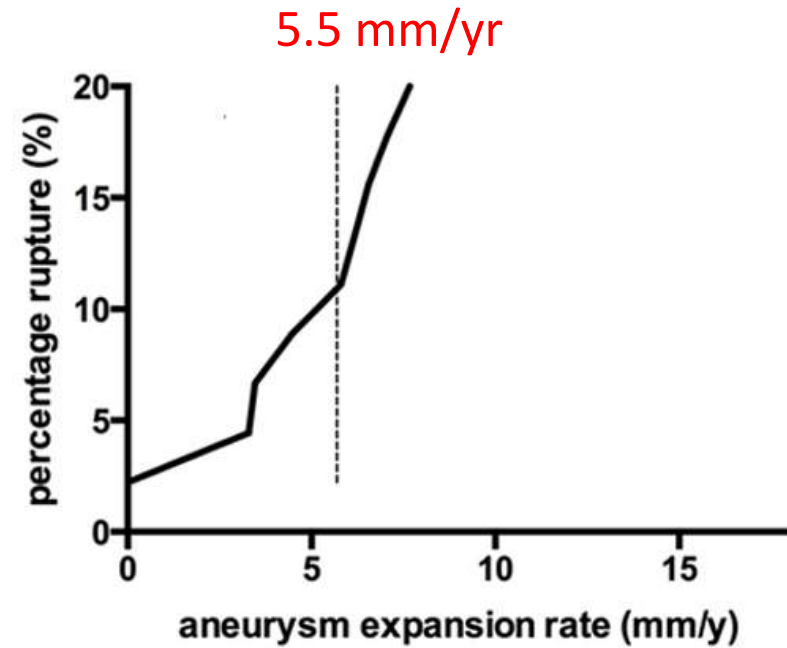
## Risk Factors

- Age
- Sex
- Smoking
- Hypertension
- Hyperlipidemia (P= .0321)
- Chronic heart diseases
- COPD
- Chronic renal diseases
- Diabetes mellitus
- Aneurysm size (>6.5cm; P= .001)
- Aneurysm morphology
- Ascending aortic diameter

## Critical Size to Rupture



## Critical Expansion rate to Rupture





# Predictors of Rupture- Simple Logistic Analysis

Predictor	OR	95% CI	P Value
Age	1.01	.90-1.14	.812
Male	1.00	.17-5.79	1.000
Current smoker	.28	.03-2.49	.252
Hypertension	.933	.20-4.35	.930
Hyperlipidemia	.82	.18-3.76	.800
Chronic heart diseases	1.00	.24-4.20	1.000
COPD	1.07	.23-4.99	.930
Chronic renal diseases	1.93	.44-8.42	.384
Diabetes mellitus	1.67	.39-7.19	.494
Size	2.64	1.10-6.33	.029 <sup>a</sup>
Expansion rate	1.50	1.12-2.00	.007 <sup>a</sup>
Saccular morphology	.94	.23-3.85	.936
Ascending Aorta Diameter	.92	.27-3.19	.897

## Predictors of Rupture- Multiple Logistic Analysis

Predictor	OR	95% CI	P Value
Size	2.33	.87-6.24	.091
Expansion rate	1.43	1.06-1.92	.018 <sup>a</sup>



# Conclusion

- Expansion rate  $>5.5$  mm/y is a significant supplementary predictor of rupture
- Aneurysm size  $>5.5$  cm is critical to rupture of true arch aneurysms
- Aneurysm size  $>6.5$  cm is associated with high expansion rate and indicate impending rupture
- Hyperlipidemia is associated with expansion rate  $>5.5$ mm/y

