Corewell Health™ | College of Human Medicine MICHIGAN STATE UNIVERSITY

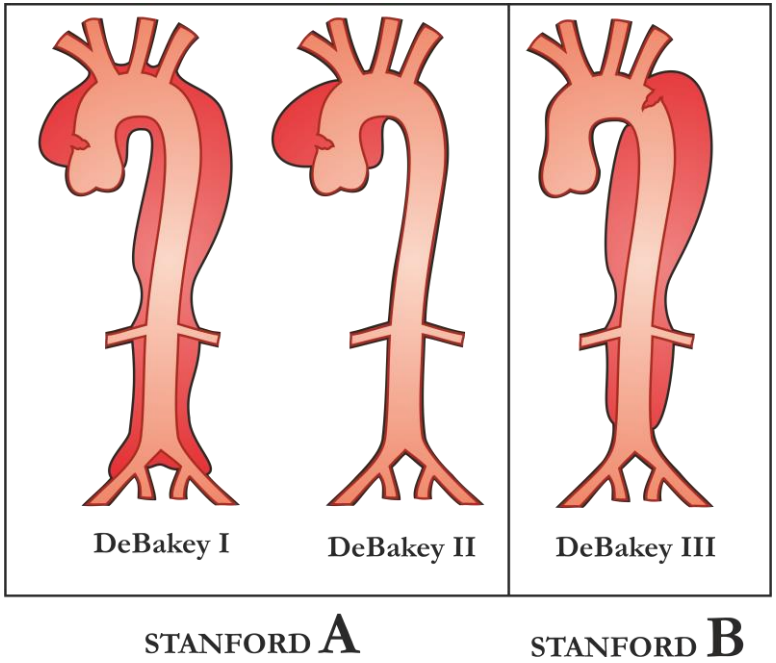
Long-term outcomes and distal aortic remodeling of DeBakey type 1 aortic dissection repair

Caleb Weissman, BS[1]; Stephen Thorp, MD[2]; Matt Lypka[2], MPH; Holliann Umana[3], MD JD; Tomasz Timek, MD PhD[2]; Stephane Leung Wai Sang, MD MSc[2]

[1]Michigan State University College of Human Medicine, Grand Rapids, Michigan
[2]Meijer Heart and Vascular Institute, Division of Cardiothoracic Surgery, Corewell Health West, Grand Rapids, Michigan
[3]Department of Thoracic and Cardiovascular Surgery, Heart, Vascular, and Thoracic Institute, Cleveland Clinic, Cleveland, Ohio, USA.

Study objectives

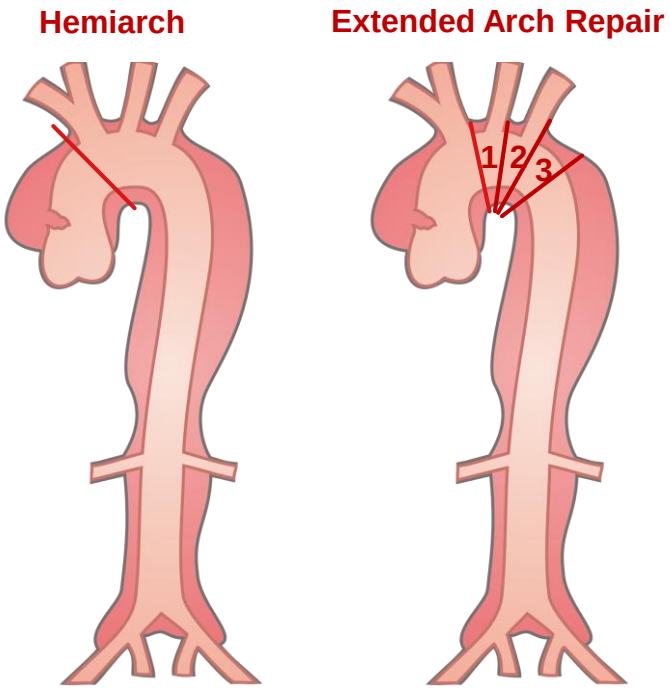
1. Compare the clinical outcomes and distal aortic remodeling in patients who had hemiarch repair versus those with an extended arch replacement in patients with DeBakey I acute aortic dissection (AAD).
2. All patients were managed post-operatively in a multidisciplinary aortic disease clinic with post-operative imaging surveillance at 1-, 6-, and 12-months, and yearly thereafter.



Credits: Vanda Machová, MD

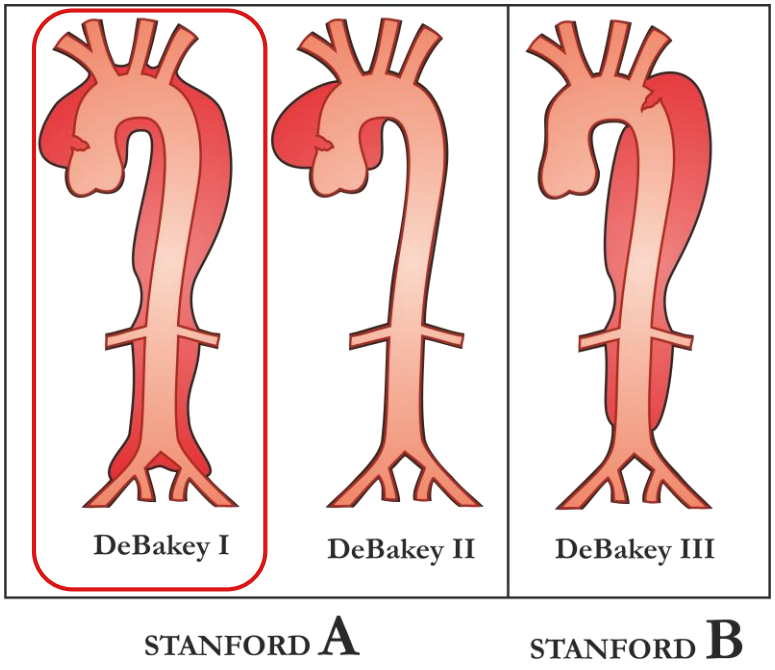
Methods

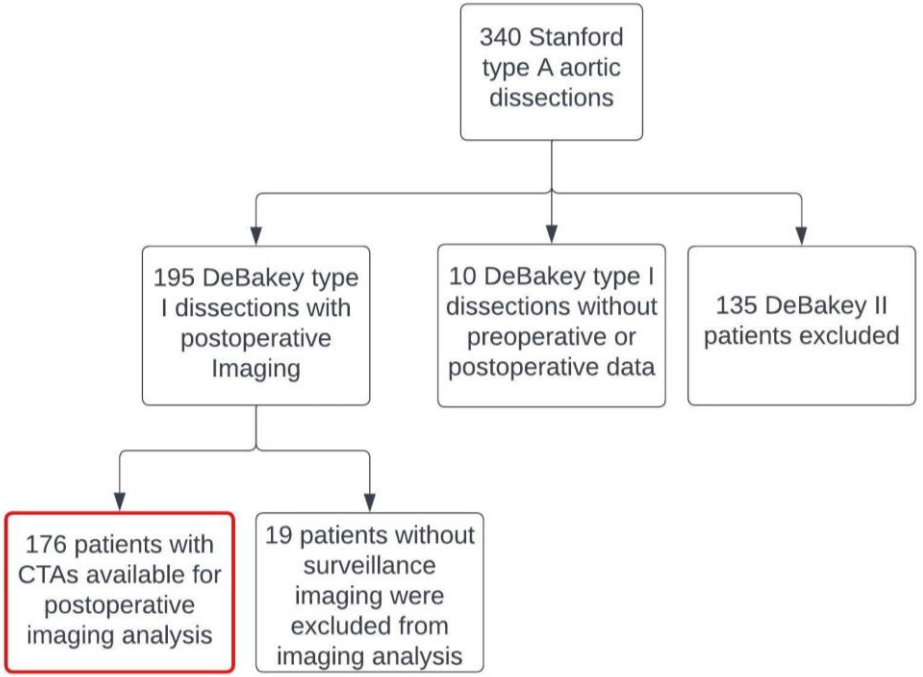
1. All patients undergoing repair of DeBakey type I AAD between January 1, 2000, and January 1, 2021, were retrospectively analyzed
2. Patients were separated into hemiarch repair and extended arch replacement groups which included zones 1, 2, or 3 arch replacements with or without elephant trunks
3. Distal aortic remodeling was evaluated by assessing growth of the residual aorta as well as false lumen thrombosis on follow-up ECG-gated computed tomographic angiography imaging
4. Linear mixed models were used to compare both aortic measurements and follow up year with subject and year follow up included as random effects



Methods

Patient selection





Credits: Vanda Machová, MD

Results

Patient demographics grouped by intervention performed

Demographics:	**Hemiarch** (n = 174)	**Extended arch repair** (n = 21)	**p-value**
Age: mean (SD)	59.8 (12.3)	58.2 (10.6)	0.481
Female: n (%)	48 (27.6%)	5 (23.8%)	0.914
Patient BMI: mean (SD)	30.2 (13.0)	30.9 (6.76)	0.33
Hypertension: n (%)	135 (77.6%)	17 (81.0%)	1.00
Diabetes: n (%)	13 (7.47%)	0 (0.00%)	0.368
Current or former smoker: n (%)	105 (60.3%)	15 (71.4%)	0.600
Chronic lung disease: n (%)	22 (12.6%)	0 (0.00%)	0.138
Renal failure - dialysis: n (%)	3 (1.72%)	0 (0.00%)	1.00
Cerebrovascular disease: n (%)	19 (10.9%)	3 (14.3%)	0.713
Peripheral Arterial Disease: n (%)	47 (27.0%)	7 (33.3%)	0.724
Prior Sternotomy: n (%)	20 (11.5%)	2 (9.52%)	1.00
Transfer from outside hospital: n (%)	108 (62.1%)	15 (71.4%)	0.548
Neurological symptoms: n (%)	44 (25.3%)	5 (23.8%)	1.00
Visceral malperfusion: n (%)	64 (36.8%)	4 (19.0%)	0.171
Limb malperfusion: n (%)	51 (29.3%)	8 (38.1%)	0.564
Shock: n (%)	12 (8.45%)	2 (10.0%)	0.685

Results

Intraoperative data

1. Similar proximal aortic interventions performed in both groups
2. Extended arch replacement patients had significantly longer circulatory arrest, cross-clamp, and bypass times
3. Similar cannulation techniques

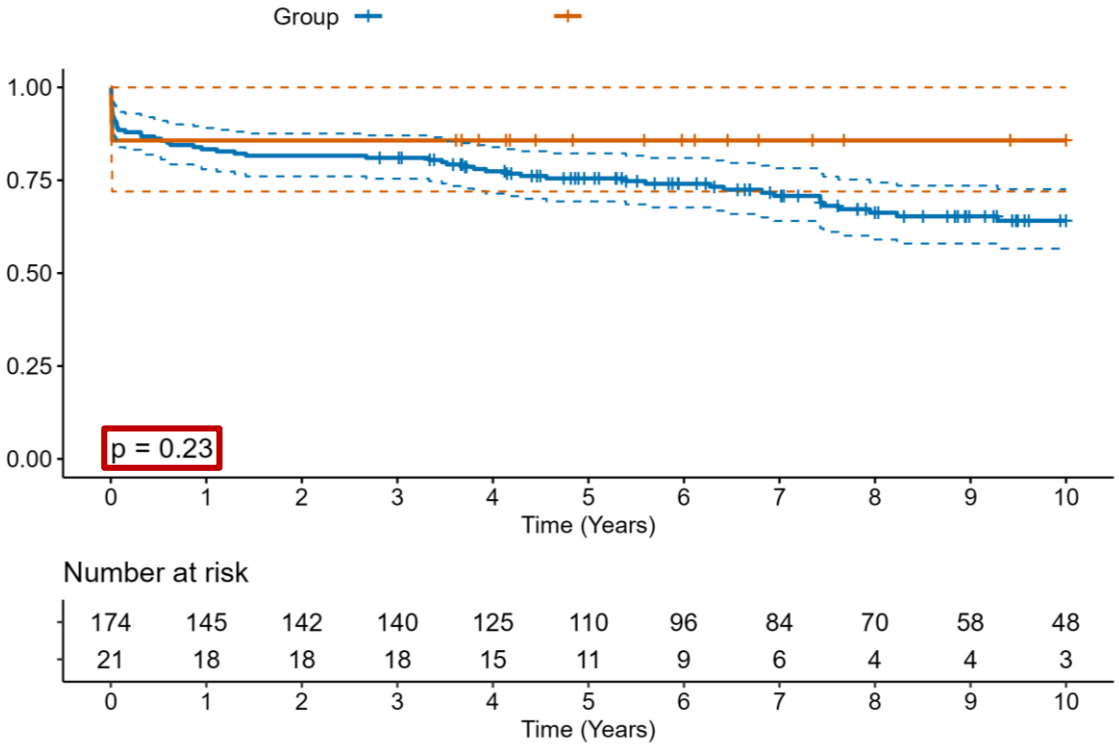
Intraoperative data:	**Hemiarch** (n = 174)	**Extended arch repair** (n = 21)	**p-value**
Aortic root replacement: n (%)	42 (24.1%)	5 (23.8%)	0.793
Isolated aortic valve replacement: n (%)	10 (5.75%)	0 (0.00%)	
Aortic valve resuspension n (%)	122 (70.1%)	16 (76.2%)	
Lowest intra-op temperature C: mean (SD)	21.3 (4.15)	18.3 (3.71)	0.006
Circulatory arrest time (mins): mean (SD)	31.5 (17.1)	59.7 (22.7)	<0.001
Cross clamp time (mins) (mean (SD)	147 (66.4)	199 (66.5)	<0.001
Cardiopulmonary bypass (CPB) time (mins): Mean (SD)	230 (84.2)	279 (91.3)	0.012
Cannulation Technique: n (%)			0.22
Axillary	95 (54.6%)	16 (76.2%)	
Direct	34 (19.5%)	2 (9.52%)	
Femoral	45 (25.9%)	3 (14.3%)	

Results

Postoperative outcomes	Hemiarch (n = 174)	Extended arch repair (n=21)	p-value
Postoperative atrial fibrillation: n (%)	52 (29.9%)	7 (33.3%)	0.941
Stroke: n (%)	26 (14.9%)	5 (23.8%)	0.34
Encephalopathy: n (%)	10 (5.75%)	0 (0.00%)	0.604
Renal failure: n (%)	36 (20.7%)	7 (33.3%)	0.262
Dialysis required: n (%)	28 (16.1%)	7 (33.3%)	0.069
Gastrointestinal event: n (%)	30 (17.2%)	2 (9.52%)	0.537
Deep venous thrombosis: n (%)	10 (5.75%)	3 (14.3%)	0.151
Pneumonia: n (%)	20 (11.5%)	4 (19.0%)	0.301
Prolonged ventilation: n (%)	81 (46.6%)	12 (57.1%)	0.492
Tracheostomy-postop: n (%)	3 (1.72%)	0 (0.00%)	1
30 Day Mortality: n (%)	20 (11.6%)	3 (14.3%)	0.752
Mortality-Primary Cause: n (%)			0.115
Cardiac	12 (57.1%)	0 (0.00%)	
Vascular	4 (19.0%)	1 (33.3%)	
Neurologic	3 (14.3%)	2 (66.7%)	
Other	2 (11.5%)	0 (0.00%)	
10-Year mortality: n (%)	55 (31.6%)	3 (14.3%)	0.230
Reintervention: n (%)			0.336
1-year:	2 (1.1%)	2 (9.5%)	
5-year:	6 (3.4%)	3 (14.3%)	
Thrombosis of false lumen: n (%)	11 (7.19%)	2 (11.1%)	0.631

Results

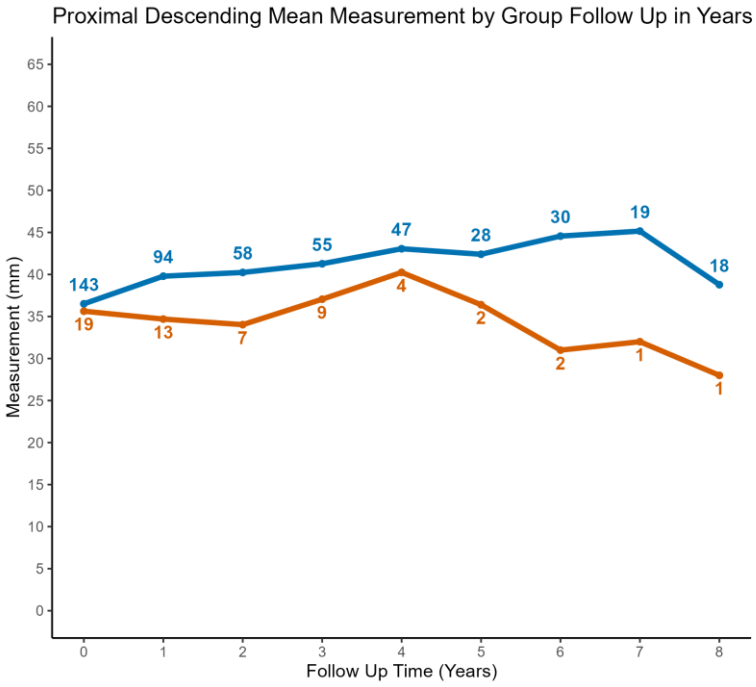
Postoperative survival – no differences in mortality between groups

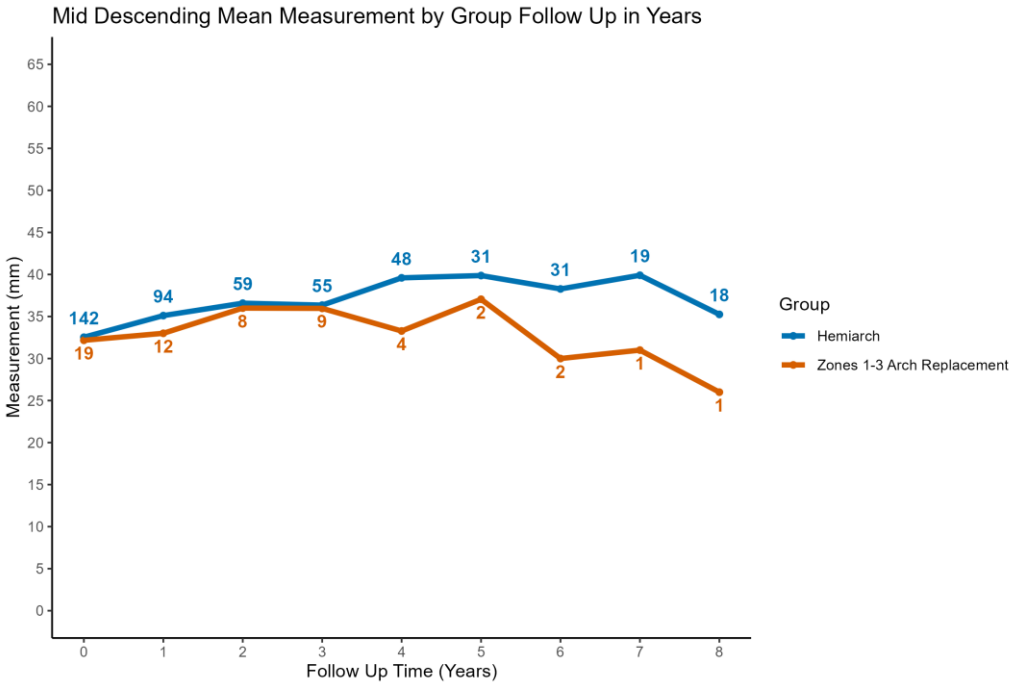


Cumulative postoperative mortality		
Time (years)	**Hemiarch** (n = 174)	**Extended arch repair** (n = 21)
1	29 (16.7%)	3 (14.3%)
5	42 (24.1%)	3 (14.3%)
10	55 (31.6%)	3 (14.3%)

Results

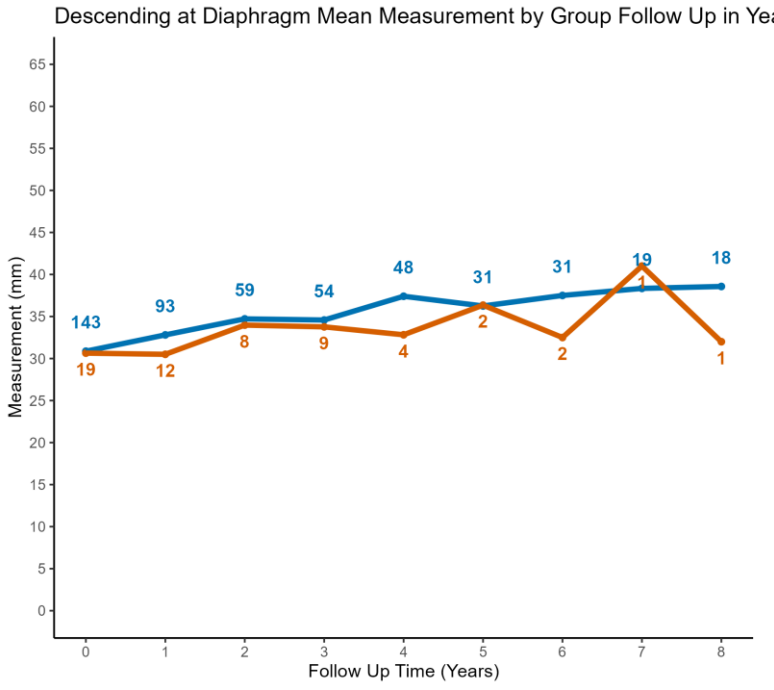
Postoperative distal aortic growth – No difference noted

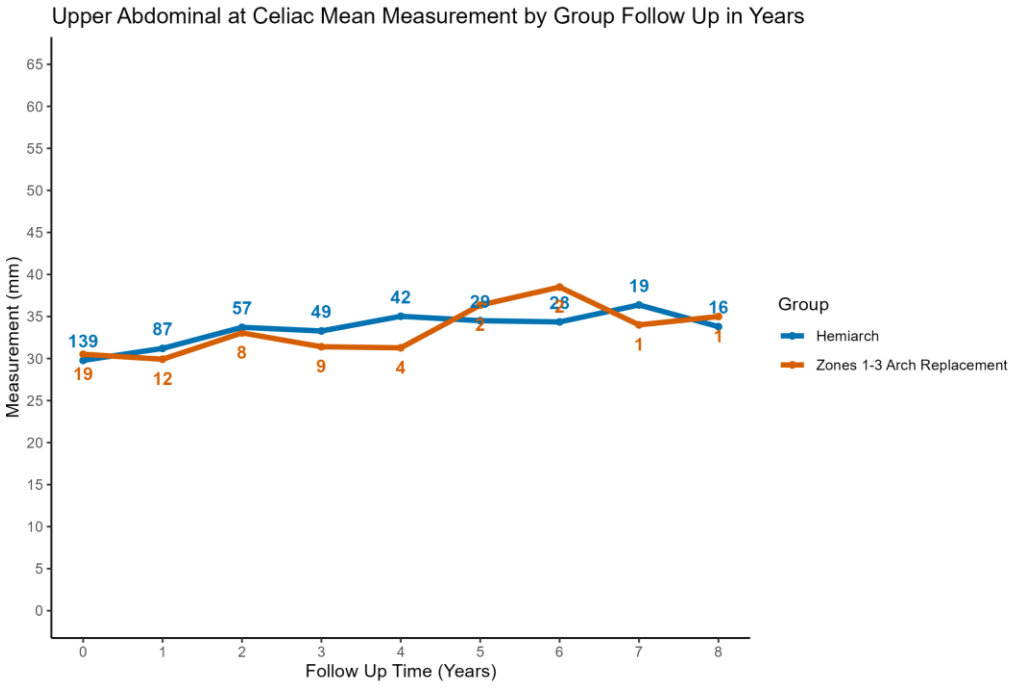




Results

Postoperative distal aortic growth – No difference noted





Results

Linear mixed models of distal aortic progression

Key points:

- Hemiarch patients were the reference group when constructing the models.
- For each region of the distal aorta, analysis was conducted looking at annual diametric growth in both cohorts.
- While the differences between groups were not statistically significant, the annual growth in all regions was significant.

Model annual growth estimates	Growth (mm)	p-value
Proximal descending aorta	0.94	<0.001
Mid descending aorta	1.06	<0.001
Descending aorta at diaphragm	1.11	<0.001
Abdominal aorta at celiac	0.90	<0.001

Conclusions

Key points:

- Similar morbidity and mortality in groups.
- Arch replacement is safe despite technical complexity.
- Lower-than-expected reintervention rate observed in both groups, possibly due to surveillance and management in aortic disease clinic
- Linear mixed models reveal progressive distal aortic growth with no differences between groups.