Impact of Obesity on Outcomes after Aortic Arch Repair with Circulatory Arrest:

A National, Multicenter Analysis

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No Disclosures

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Background

- ***1 in 3*** adults are ***overweight***, ***2 in 5*** are ***obese***, and ***increasing***
- Obesity has variable reported effects on post-surgical outcomes
- Special considerations of obesity in **aortic operations**: ***increased technical complexity***, heating/cooling duration, ***circulatory arrest duration***, and ***impaired recovery***
- One study linked obesity to ***increased perioperative risk of type A dissection***, but number of obese patients was limited

Overall, the effect of obesity on outcomes of aortic surgery with circulatory arrest remains unclear

NIH Data
Valentijn et al Surgeon 2013
Ma et al BMC Surgery 2022
Shimizu et al Circ Reports 2020
Mariscalco et al Circulation 2017

Objective

*Compare perioperative outcomes of **aortic surgery with circulatory arrest** by **body habitus** in a national multicenter database*

Ideal Weight
(BMI 18.5-24.9)

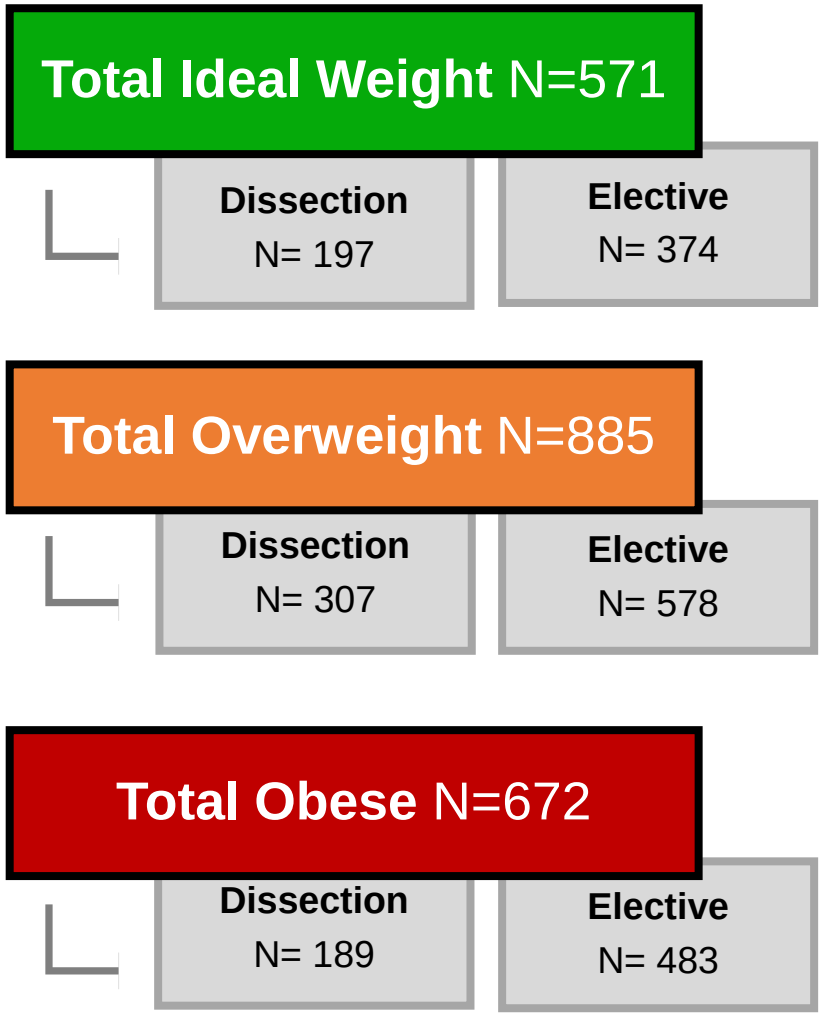
Overweight
(BMI 25 - 30)

Obese
(BMI > 30)

SUBGROUPS

1. Elective Operation
2. Acute Type A Dissection

Methods



Included:

- All patients undergoing aortic arch repair with circulatory arrest from national database, 9 centers (2002-2021)

Excluded:

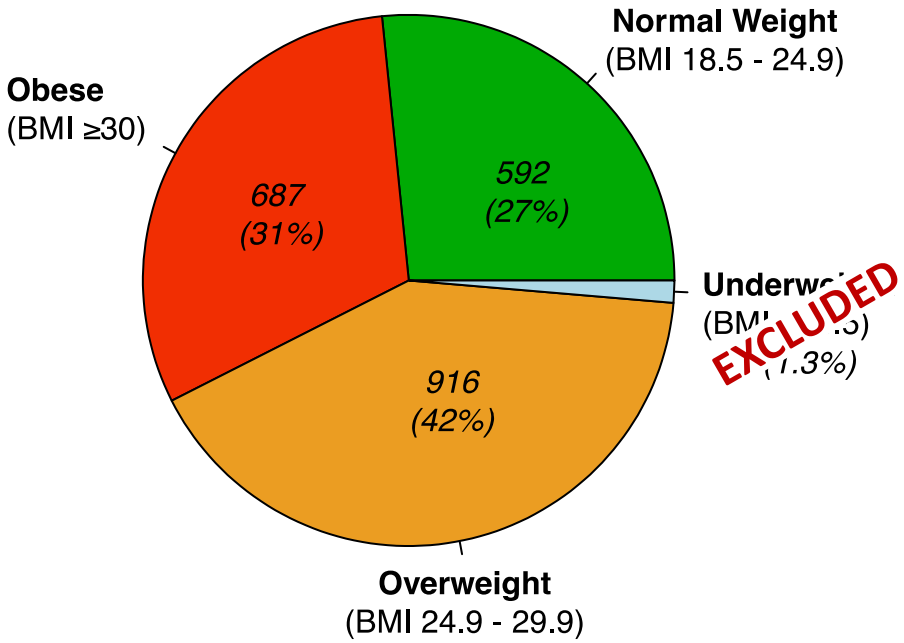
- No BMI data, Thoracoabdominal incision, underweight (minority)

Statistical Analysis:

- **1˚ outcomes:** In hospital death, hospital length of stay
- **2˚ outcomes:** perioperative complications
- **Linear regression:** association of weight parameters with perfusion parameters
- **Multivariable logistic regression:** for primary outcomes to account for baseline differences *(Prolonged hospital length of stay defined as >15 days, 3rd quartile)*
- **Sub-analysis:** Elective & Acute Type A Dissection

Baseline Characteristics

Total cohort



	Normal N=571	Overweight N=885	Obese N=672	P
Age (mean (SD))	63.97 (13.93)	63.83 (12.79)	61.20 (12.31)	**<0.001**
Male	336 (58.8)	668 (75.5)	495 (73.7)	**<0.001**
Dyslipidemia	237 (41.5)	427 (48.2)	343 (51.0)	**0.003**
Hypertension	372 (65.1)	621 (70.2)	506 (75.3)	**<0.001**
Diabetes Mellitus	41 (7.2)	87 (9.8)	137 (20.4)	**<0.001**
Smoking	145 (31.4)	206 (28.9)	189 (34.6)	0.092
Renal Failure	12 (2.1)	21 (2.4)	16 (2.4)	0.932
COPD	80 (14.0)	74 (8.4)	80 (11.9)	**0.002**
Height (mean (SD))	164.73 (30.26)	168.33 (26.32)	166.05 (29.94)	0.052
Weight (mean (SD))	65.28 (9.32)	80.98 (11.20)	101.23 (17.16)	**<0.001**
NYHA				**0.037**
No symptoms	93 (16.5)	116 (13.3)	82 (12.4)	
Class I	248 (44.0)	373 (42.8)	258 (39.0)	
Class II	117 (20.7)	211 (24.2)	170 (25.7)	
Class III	81 (14.4)	131 (15.0)	128 (19.3)	
Class IV	25 (4.4)	41 (4.7)	24 (3.6)	
BSA (mean (SD))	1.75 (0.17)	1.95 (0.27)	2.14 (0.23)	**<0.001**
Acute Dissection	197 (34.5)	307 (34.8)	189 (28.2)	**0.012**
Aortic Rupture	33 (5.8)	29 (4.3)	68 (7.7)	**0.022**
Cerebrovascular History				0.405
Stroke	45 (7.9)	61 (6.9)	36 (5.4)	
TIA	15 (2.6)	29 (3.3)	18 (2.7)	

Fewer type A dissections in **Obese** class but ***greater*** proportion of ***rupture***

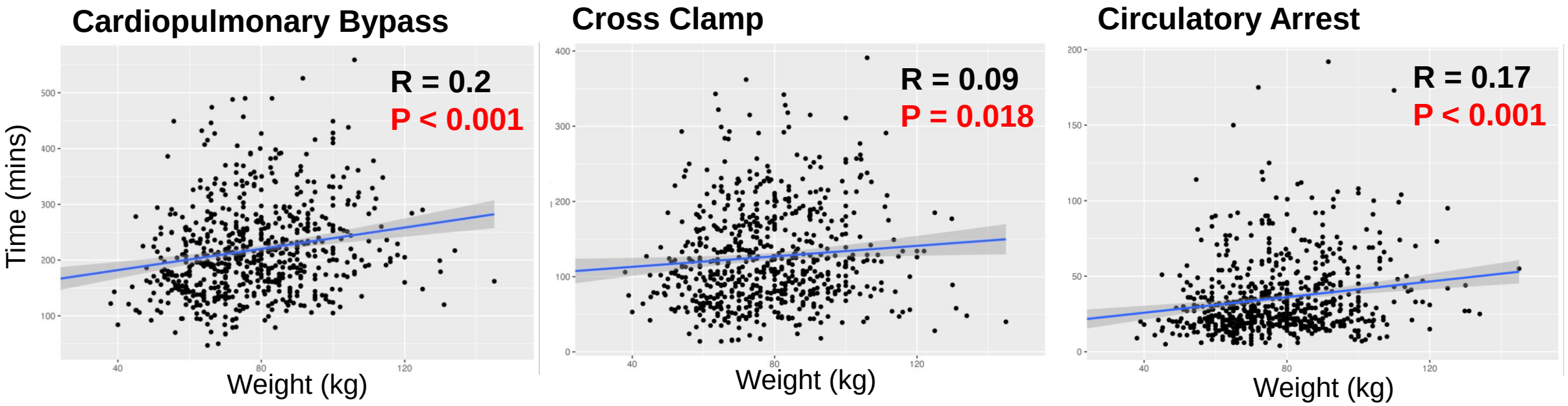
Intraoperative Details

Total cohort

Similar complexity of operations and extent of aortic repair

	Normal N=571	Overweight N=885	Obese N=672	P
Hemiarch	420 (73.6)	689 (77.9)	525 (78.1)	0.096
Extended Arch	132 (23.1)	168 (19.0)	133 (19.8)	0.146
AVR				0.403
None	432 (75.7)	688 (77.7)	524 (78.0)	
Bio	106 (18.6)	160 (18.1)	109 (16.2)	
Mechanical	33 (5.8)	37 (4.2)	39 (5.8)	
Bentall				0.795
None	420 (73.6)	656 (74.1)	511 (76.0)	
Bio	85 (14.9)	136 (15.4)	88 (13.1)	
Mechanical	65 (11.4)	92 (10.4)	73 (10.9)	
Homograft	1 (0.2)	1 (0.1)	0 (0.0)	
Valve Sparing Root Replacement	46 (8.1)	86 (9.7)	75 (11.2)	0.184
Cardiopulmonary Bypass Time (mins)	172.00 [133.00, 216.50]	172.00 [129.00, 232.00]	178.00 [125.50, 230.00]	0.547
Clamp Time (mins)	100.00 [70.00, 136.00]	104.50 [72.00, 149.00]	102.50 [68.25, 148.50]	0.231
Cerebral Perfusion (mins)	17.00 [8.00, 28.00]	17.00 [9.00, 27.00]	18.00 [10.00, 27.00]	0.287
Cerebral Perfusion Strategy				0.322
None	87 (15.2)	117 (13.2)	86 (12.8)	
Unilateral Antegrade	454 (79.5)	717 (81.1)	547 (81.4)	
Bilateral antegrade	22 (3.9)	27 (3.1)	29 (4.3)	
Retrograde	8 (1.4)	23 (2.6)	10 (1.5)	

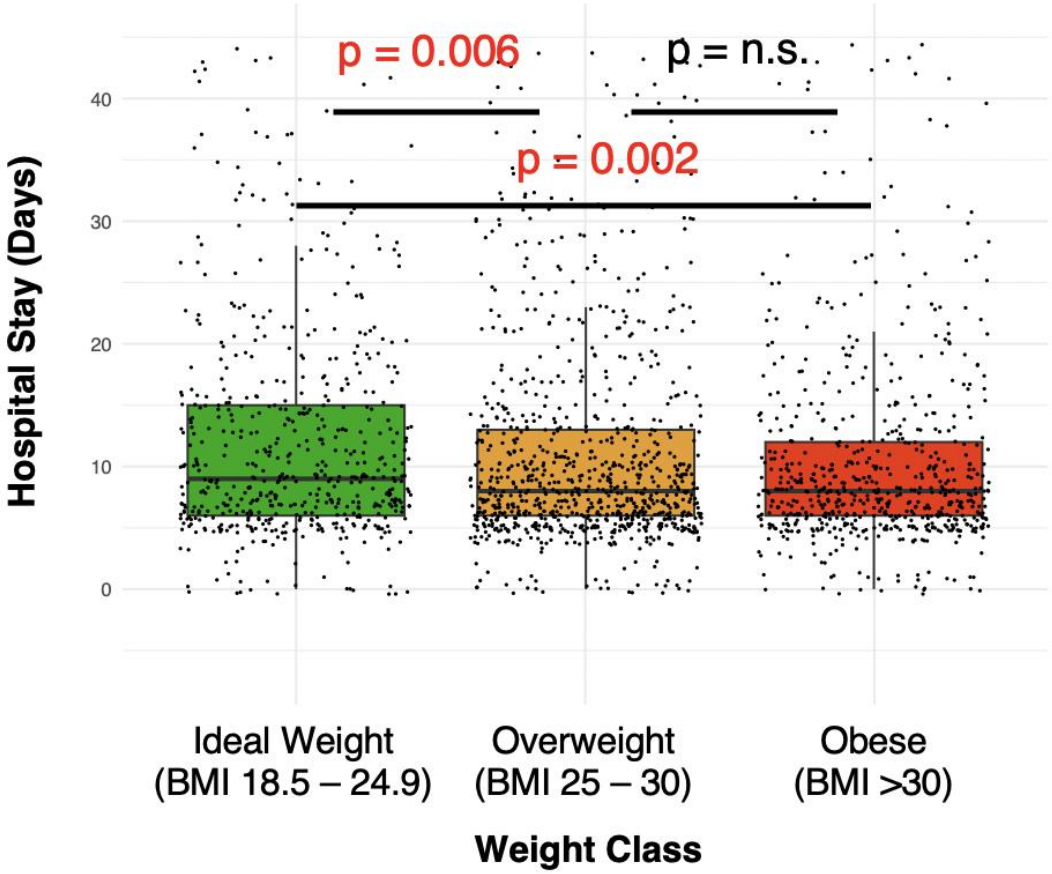
Correlation of Weight with Perfusion Durations *Total cohort*



Statistically significant (modest) correlation of absolute ***weight*** with ***all perfusion parameters*** (comparable complexity of operations)

Unadjusted Outcomes *Total cohort*

Unadjusted Hospital Length of Stay by Weight Class



	Normal N=571	Obesity N=672	Overweight N=885	p-test
Death	53 (9.3)	64 (9.6)	84 (9.5)	0.988
Stroke	48 (8.4)	61 (9.1)	84 (9.5)	0.78
Reoperation	59 (10.3)	55 (8.2)	89 (10.1)	0.356
RBC (mean (SD))	2.27 (3.04)	1.56 (3.09)	2.22 (4.75)	**0.001**
Platelets (mean (SD))	5.87 (8.16)	4.46 (7.03)	5.50 (8.07)	**0.003**
Renal Failure	26 (4.6)	45 (6.7)	56 (6.3)	0.234
Sepsis	19 (3.3)	30 (4.5)	43 (4.9)	0.364
Mediastinitis	4 (0.7)	5 (0.7)	10 (1.1)	0.619
Long ventilation (>40hrs)	120 (21.1)	132 (19.7)	168 (19.0)	0.626
Hospital Stay (days)	9.00 [6.00, 16.00]	8.00 [6.00, 13.00]	8.00 [6.00, 14.00]	**<0.001**
ICU Stay (days)	2.31 [1.00, 5.00]	2.00 [1.00, 5.00]	2.00 [1.00, 5.00]	0.289
Composite Outcome	194 (34.2)	199 (29.7)	276 (31.3)	0.237

Reduced *unadjusted* ***hospital length of stay*** *among* ***higher*** *weight classes*

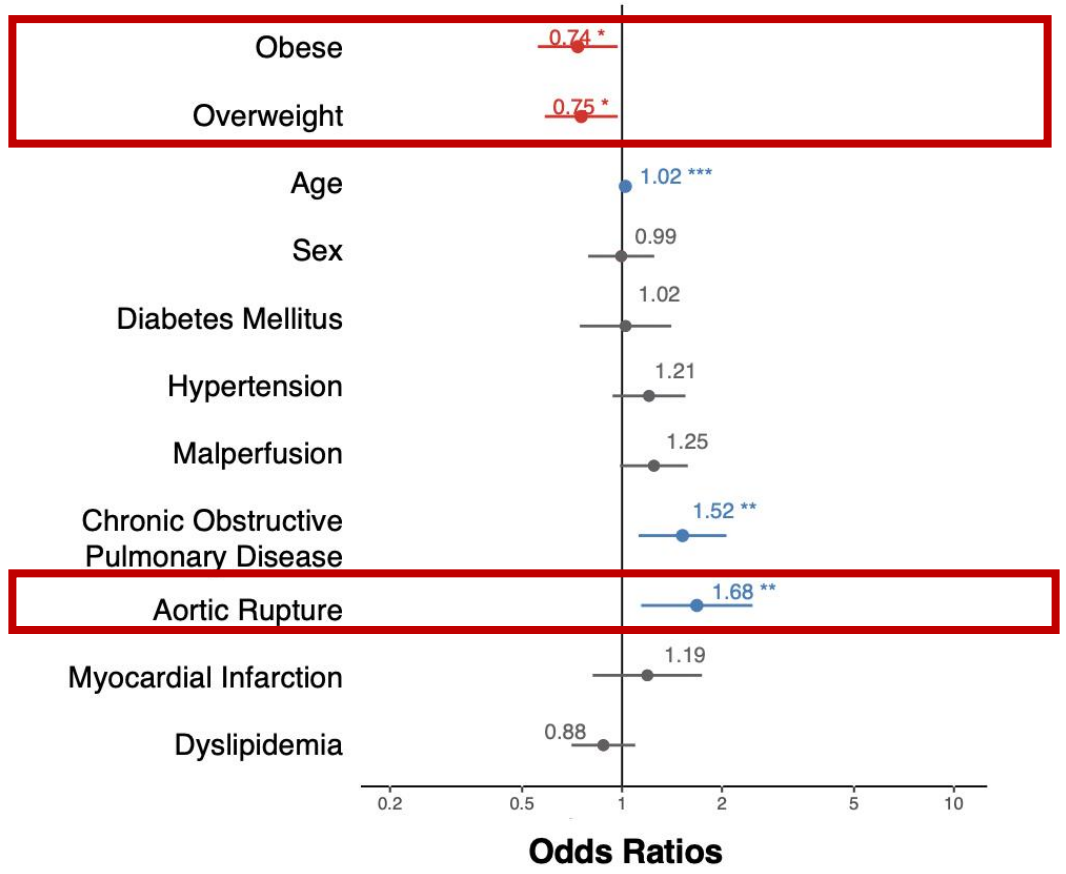
Adjusted Outcomes

Total cohort & Subgroups

Multivariable Logistic Regression of Primary Outcomes

Outcome (*vs. ideal weight*)		**OR (95%CI)**	**P-value**
Hospital Length of Stay ≥ 15 days			
All Patients	**Obese**	**0.74 (0.58-0.93)**	**0.03**
	Overweight	**0.75 (0.61-0.93)**	**0.03**
Acute Dissection	Obese	0.76 (0.49-1.16)	0.28
	Overweight	1.05 (0.73-1.52)	0.81
Elective	Obese	0.77 (0.58-1.03)	0.14
	Overweight	**0.61 (0.46-0.81)**	**0.004**
In-Hospital Mortality			
All Patients	Obese	1.14 (0.81-1.62)	0.53
	Overweight	1.05 (0.76-1.44)	0.81
Acute Dissection	**Obese**	**2.55 (1.56-4.18)**	**0.002**
	Overweight	1.62 (1.03-2.54)	0.082
Elective	Obese	0.70 (0.37-1.32)	0.35
	Overweight	0.74 (0.42-1.32)	0.39

Forest Plot of Prolonged (>15 day) Hospital Stay, total cohort



Limitations

- Long term follow up data collection in progress
- BMI as a measure of adiposity is subject to limitations among patients with elevated muscle mass
- Nutritional status not captured in the database (e.g. albumin level)
- Baseline differences partially mitigated by multivariable regression and subgroup analyses but persistent confounding and unknown/unmeasured confounders remain

Conclusion

- **Most (73%)** of aortic surgical patients are **overweight or obese**
- Obese patients are **younger**, fewer present in **acute dissection**
- Similar complexity of operations performed in all weight classes
- Perioperative risk of death similar regardless of weight class
  - ***Excess mortality*** observed in ***Obese*** patients with ***type A dissection,*** possibly driven by presentation with ***rupture***
- **Obesity** is **independently associated** with **reduced hospital length of stay**
- **KEY MESSAGE:** Obesity should not preclude patients from aortic surgery with circulatory arrest, however caution should be taken in type A dissection.