Evaluating Postoperative Outcomes in Total Aortic and Hemiaortic Arch Repairs Based on Cardiothoracic Surgery Fellow Year in Training

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Background

Surgeons working at academic centers are given the difficult tasks of both ensuring patient safety and incorporating varying levels of trainees into increasingly complex surgeries to develop technical skills.

We examined outcomes of aortic repairs stratified by fellow year in training to investigate any potential impact on patient and procedural outcomes.

Methods

From June of 2009 to May of 2021, 23 trainees participated in the CT fellowship at the University of Colorado Hospital. Patients who received a total aortic arch (TAR) or hemiarch repair by one or more fellows were identified. The primary outcomes for this study focused on postoperative outcomes including length of stay and morbidity and mortality. Patients presenting with dialysis dependent chronic kidney disease and clinical evidence of malperfusion were excluded from analysis. Secondary outcomes included operative times and intraoperative transfusion of blood products. Outcomes were compared using univariate analysis. COMIRB #17-0198.

Results

Pre-Operative Characteristics

	Patients operated on by 1st year fellows	Patients operated on by 2nd year fellows	Patients operated on by 3rd year fellows	P value
N	55	168	416	---
Age (years)	60.0±15.0	58.2±13.5	59.2±13.9	0.617
Gender				0.953
Female	15 (27.3)	49 (29.2)	117 (28.1)	
Male	40 (72.7)	119 (70.8)	299 (71.9)	
Ethnicity				
Asian	1 (1.8)	6 (3.6)	9 (2.2)	0.581
Black/African American	1 (1.8)	16 (9.5)	42 (10.1)	0.136
Caucasian	45 (81.8)	125 (74.4)	330 (79.3)	0.341
Hispanic	7 (12.7)	15 (8.9)	27 (6.5)	0.204
Other	1 (1.8)	6 (3.6)	8 (1.9)	0.477
BMI	28.1±6.7	29.0±6.4	28.2±6.2	0.403
Dyslipidemia	21 (38.2)	57 (33.9)	135 (32.5)	0.631
Hypertension	40 (72.7)	125 (74.4)	275 (66.1)	0.119
Smoking	20 (36.4)	41 (24.4)	106 (25.5)	0.189
Diabetes	3 (5.5)	19 (11.3)	43 (10.3)	0.471
Renal disease	3 (5.5)	20 (11.9)	38 (9.1)	0.176
Peripheral vascular disease	2 (3.6)	3 (1.8)	13 (3.1)	0.628
Prior stroke	1 (1.8)	14 (8.3)	49 (11.8)	0.048
Coronary artery disease	3 (5.5)	15 (8.9)	52 (12.5)	0.189
Autoimmune disease	0 (0.0)	5 (3.0)	9 (2.2)	0.424

Procedural Characteristics and Outcomes

	Patients operated on by 1st year fellows	Patients operated on by 2nd year fellows	Patients operated on by 3rd year fellows	P-value
N	55	168	416	---
Aortic Presentation				
Dissection	11 (20.0)	39 (23.2)	71 (17.1)	0.224
Aneurysm	29 (52.7)	107 (63.7)	263 (63.2)	0.296
Dissection and aneurysm	14 (25.5)	20 (11.9)	68 (16.3)	0.055
Thrombus/atheroma	1 (1.8)	2 (1.2)	5 (1.2)	0.925
Other	0 (0.0)	0 (0.0)	10 (2.4)	0.067
Operative acuity				
Elective	32 (58.2)	99 (58.9)	268 (64.4)	0.367
Urgent	15 (27.3)	26 (15.5)	69 (16.6)	0.096
Emergent	8 (14.5)	43 (25.6)	79 (19.0)	0.144
Hemiarches performed	44 (80.0)	135 (80.4)	294 (70.7)	0.031
Total arches performed	11 (20.0)	33 (19.6)	122 (29.3)	0.031
Cardiopulmonary bypass time (min)	199.2±67.6	187.0±77.6	169.6±67.6	0.520
Crossclamp time (min)	121.1±60.3	123.8±61.6	103.2±49.2	<0.0001
Circulatory arrest time (min)	26.8±16.7	19.5±14.7	15.6±11.7	<0.0001
Nadir bladder temperature (°C)	24.4±3.0	25.7±2.8	26.2±2.4	<0.0001
Intraoperative Transfusion				
Total	8.4±8.5	8.3±10.1	7.5±9.1	0.628
pRBCs	1.7±3.2	2.1±4.1	1.8±3.5	0.657
FFP	4.8±4.6	4.6±5.2	4.0±4.7	0.343
Platelets	1.9±1.4	1.6±1.4	1.7±1.5	0.458
ICU length of stay (days)	4.0±2.9	5.6±10.1	5.5±7.2	0.467
Total length of stay (days)	9.4±6.7	11.4±10.7	12.1±11.7	0.253
Spinal cord ischemia	0 (0.0)	1 (6.0)	4 (1.0)	0.711
Delirium/altered mental status	5 (9.1)	17 (10.1)	53 (12.7)	0.564
Stroke	5 (9.1)	15 (8.9)	44 (10.6)	0.912
Acute kidney injury requiring renal replacement therapy	3 (5.5)	11 (6.5)	20 (4.8)	0.775
Acute respiratory failure	5 (9.1)	15 (8.9)	37 (8.9)	0.959
Myocardial infarction	0 (0.0)	0 (0.0)	4 (1.0)	0.342
Death (during same hospital admission)	1 (1.8)	15 (8.9)	34 (8.2)	0.221
Emergent/urgent	1 (1.8)	13 (7.7)	19 (4.6)	
Elective	0 (0.0)	2 (1.2)	15 (3.6)	

639 patients met inclusion criteria. History of prior stroke was the only noted significant preoperative difference between cohorts ($p = 0.048$). Cross clamp times decreased between second- and third-year cohorts ($p \leq 0.0001$). Circulatory arrest times decreased between first- and third-year cohorts ($p \leq 0.0001$). Mean nadir operative temperatures increased between first, second-, and third-year cohorts ($p \leq 0.0001$). CPB times showed a progressive decrease between the first-year cohort and the third-year group, but the difference was not significant ($p = 0.520$).

Conclusion

Overall, we found similar perioperative outcomes among our first-, second-, and third-year fellows. Though the operative times are longer, this had no bearing on the postoperative complications seen in our patients who underwent TAR and hemiarch repairs. More junior trainees can and should be exposed to these more complicated cases early in their training.

Future Directions/Limitations

Data will be updated to include current data prior to submission; currently up to date through 2021. Reoperation will also be added as a primary outcome, and data will be stratified by attending surgeon to avoid confounding variables.

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