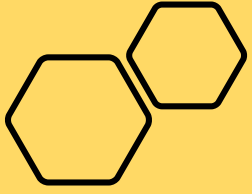




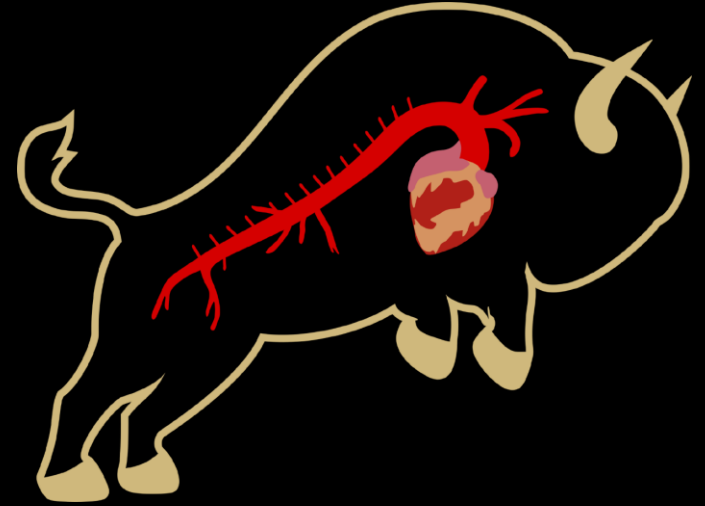
Acute Kidney Injury of Any Degree in Total Arch Surgery Contributes to Stepwise Increase in Post-Operative Morbidity and Mortality

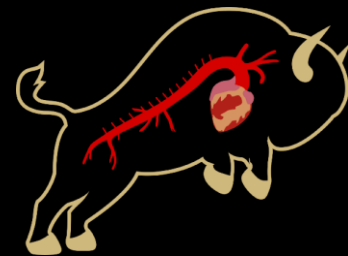
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No disclosures

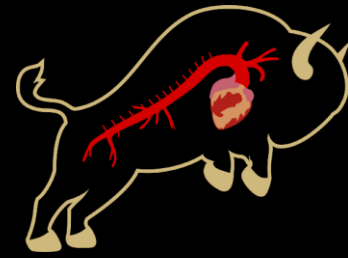




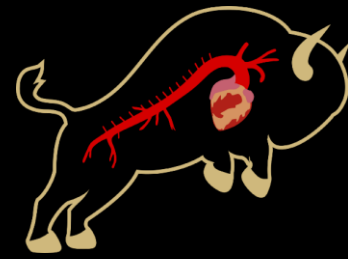
Introduction

- Well-established that acute kidney injury in total arch surgery significantly increases morbidity and mortality
- However, AKI definition typically defined by STS criteria
- Current STS guidelines only capture stage 3, most severe degree of AKI
- We hypothesized that even mild AKI could be reflective of greater whole-body injury in total arch surgery given longer circulatory arrest times required

Aim

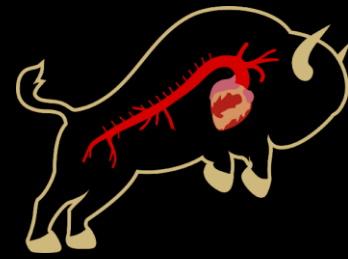


- Investigate spectrum of acute kidney injury in total arch surgery and impact on post-operative outcomes
- Determine pre- and intra-operative risk factors associated with AKI development



Methods

- Institutional aortic database assessed from 2014-2023 to identify patients undergoing total arch surgery
- Patients stratified into cohorts based on develop of post-operative AKI
 - AKI defined by Kidney Disease Improving Global Outcomes (KDIGO) criteria
 - AKI determined by difference in pre and post-operative creatinine (within 48 hours) or new renal replacement therapy
 - Urine output excluded as criteria given confounds in cardiac surgery
 - To optimize study power, combined stage 2 and stage 3 KDIGO into one cohort (Stage 2/3 AKI)
- Assess relationship with pre-operative and operative variables with development of AKI
- Assess how AKI of different KDIGO stage affects in-hospital outcomes
- Perform Adjusted Cox proportional hazard regression to determine in-hospital mortality based on KDIGO stage



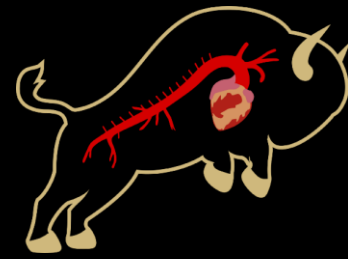
Results

- 235 patients total identified
 - Any degree of AKI occurred in 95 patients (40.4%)
 - 27 Stage 2/3 patients required renal replacement therapy
- Procedural urgency and cardiopulmonary bypass time associated with development of AKI
 - No contribution from circulatory arrest or cross-clamp time

Table 1. Demographic and Peri-operative Predictor Analysis of Kidney Injury per KDIGO class in Total Arch Replacement

	No AKI (N=140)	Stage 1 (N=58)	Stage 2 + 3 (N=37)	P-value
Age (years)	60.4 (50.7 - 68.9)	59.0 (47.7 - 66.0)	63.4 (50.1 - 68.4)	0.476
BMI (kg/m ²)	27.2 (23.8 - 31.2)	27.7 (22.9 - 32.3)	26.1 (22.8 - 28.1)	0.462
Comorbidities				
Dyslipidemia	47 (33.6%)	15 (25.9%)	12 (32.4%)	0.563
Hypertension	90 (76.2%)	39 (78.0%)	13 (61.9%)	0.325
Smoking	33 (27.9%)	12 (24.0%)	3 (14.3%)	0.446
Type II DM	11 (9.32%)	3 (6.0%)	1 (4.76%)	0.719
Chronic Kidney Disease	12 (10.2%)	5 (10.0%)	3 (14.3%)	0.827
Coronary Artery Disease	5 (4.23%)	5 (10.0%)	3 (14.3%)	0.109
Urgency				
Elective	63 (53.4%)	18 (36.0%)	5 (23.8%)	
Urgent	32 (27.1%)	14 (28.0%)	2 (9.5%)	< 0.001
Emergent	23 (19.5%)	18 (36.0%)	14 (66.7%)	
Bladder Temp Nadir (°C)	25.6 (22.1 - 26.9)	26.0 (22.2 - 28.0)	24.9 (23.1 - 27.2)	0.637
CBP Time (min)	184 (149 - 216)	211 (150 - <u>248</u>)*	207 (172 - <u>261</u>)*	0.023
Cross-clamp time (min)	88 (60 - 126)	105 (65 - 160)	98 (52 - 147)	0.164
Circulatory Arrest time (min)	23 (17 - 32)	23 (17 - 41)	23 (16 - 31)	0.682

Data reported as median with corresponding IQR or as a number of categorical subjects with % ratio. 3 group comparison is Kruskal-Wallis, * > 0.05 and ** > 0.01 from No AKI. Categorical analysis is Fisher's exact or χ^2 test. (BMI = Body Mass Index, DM = Diabetes Mellitus, PVD = Peripheral Vascular Disease, CBP = cardio-pulmonary bypass, AKI = acute kidney injury).



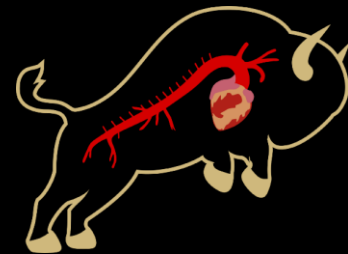
Results

- Stepwise increase depending on AKI severity for:
 - Hospital, ICU length of stay
 - Prolonged ventilation (>48 hours), infection
 - Mortality, MACE

Table 2. KDIGO Classification Association with Post-Operative Outcomes in Total Arch Replacement

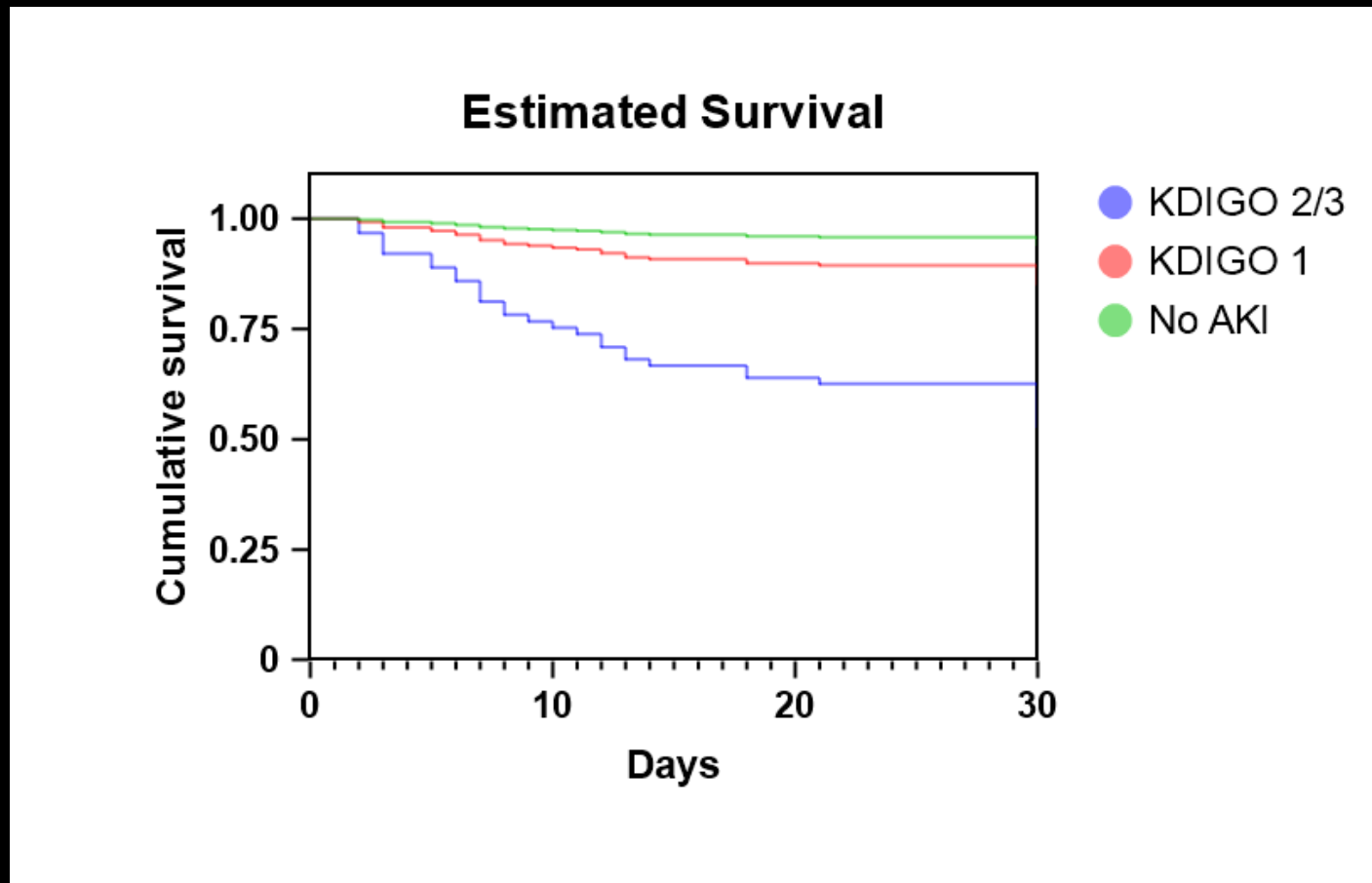
	No AKI (N=140)	Stage 1 (N=58)	Stage 2 + 3 (N=37)	P-value
Hospital <u>stay</u> (days)	10 (8 - 15)	13.5 (10 – 19.8)	18 (11 – 28.5)	< 0.001
ICU length of stay (days)	4 (3 – 6)	6 (3-7.75)	9.5 (7 – 15.5)	< 0.001
Mortality	7 (5.0%)	6(10.3%)	16 (43.2%)	< 0.001
MACE	22 (15.7%)	20 (34.4%)	22 (59.5%)	< 0.001
Venous Thrombus/Emboli	4 (2.9%)	2 (3.4%)	5 (13.5%)	0.028
Prolonged Ventilation	15 (10.7%)	11 (19.0%)	17 (45.9%)	< 0.001
Infection	16 (11.4%)	8 (13.8%)	12 (32.4%)	0.006
Arrhythmia	23 (16.4%)	9 (15.5%)	17 (45.9%)	< 0.001
Coagulopathy	10 (8.4%)	6 (12.0%)	4 (19.0%)	0.324

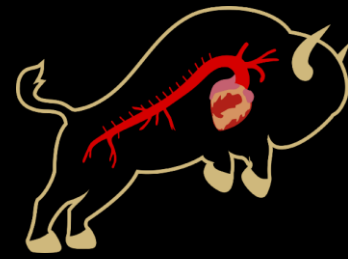
Data reported as median with corresponding IQR or as a number of categorical subjects with % ratio. 3 group comparison is Kruskal-Wallis, Fisher's exact or χ^2 test. (AKI = acute kidney injury, MACE = major adverse cardiac events).



Results

- Adjusted Cox proportional hazards ratio showed stepwise increase in risk of mortality depending on severity of AKI ($p < 0.001$, hazard ratio 2.63, 11.07)





Conclusions

- Acute kidney injury occurs across a spectrum in total arch surgery
- Even mild AKI poses increased risk of morbidity and mortality
- Current quality guidelines do not account for mild AKI
- Quality guidelines should be adjusted to account for minor kidney injury as it may contribute to increased morbidity and mortality

Questions???

