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Enhanced Recovery after Cardiac Surgery (ERACS): Early Findings from a Pilot, Observational Study

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INTRODUCTION: The objective of this study is to compare the impact of an early Enhanced Recovery After Cardiac Surgery (ERACS) program to traditional perioperative cardiac surgery care on hospital length. The application of ERAS to cardiac surgery is a recent development (2017) and there have only been a small number of studies published in this field to date. ERACS research aims to challenge traditional paradigms in cardiac surgery to improve patient outcomes and experiences and to reduce associated health care costs.

METHODS: This single-center, pilot study is observational with 100 patients in both the ERAS group (prospectively collected) and the traditional perioperative care group (historical cohort). The ERACS program implemented consists of a bundle of 20 interventions in the pre-, intra-, and postoperative periods. This study (n=200) has 94% power to detect a difference of 2-days in hospital length of stay, the primary endpoint. Secondary outcomes that were measured include readmission rate in 30 days, hospitalization costs, and rates of perioperative complications.

RESULTS: The study population includes individuals aged 18-85 years-old undergoing low to medium risk, elective or semi-elective cardiac surgeries and multiple procedure types. The results of the control group are being accessed for comparative analysis but were not available at the time of abstract submission. The ERACS group had a median hospital length of stay of 5 days.

CONCLUSION: Next steps for the local ERACS program include consistent application of regional anesthesia and implementation of new interventions such as delirium screening and goal-directed fluid therapy postoperatively.

Off- Vs On-pump Coronary Revascularization: A Single Surgeon Study

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INTRODUCTION: Multi-center, multi-surgeon randomized controlled trials have reported that off-pump coronary artery bypass grafting (OPCAB) has either equivalent or inferior outcomes compared to on-pump arrested heart coronary artery bypass grafting (PCAB-A). We present a single-surgeon observational study to remove the confounding bias of multiple surgeon expertise and multiple center cost variations.

METHODS: A retrospective review of 129 patients that underwent coronary artery bypass grafting (CABG) between September 2015-January 2019 was analyzed. Fifty-one patients underwent OPCAB and 78 underwent PCAB-A according to the surgeon's discretion. Quality and cost metrics were analyzed.

RESULTS: A higher percentage of OPCAB patients had previous coronary artery stents before undergoing CABG compared to PCAB-A (35% vs. 17%, $p=0.02$). The number of grafts and OR time in the OPCAB group was significantly less than PCAB-A: 2.2 vs. 3.15, $p=0$ (grafts), and 298.24 vs. 357.69 min, $p=0$ (OR time), respectively. OPCAB had a shorter ICU length of stay (2.08 vs. 2.44 days, $p=0.273$), shorter total ventilation time (1.18 vs. 1.54 days, $p=0.055$), and required less pRBC compared to PCAB-A (41% vs. 64%, $p=0.715$). OPCAB also had lower revascularization rate at one year (7% vs. 13%, $p=0.355$) and significantly lower OR cost (\$8,657 vs. \$13,247 $p=0$). The cost difference between the two groups for the entire length of the hospitalization was \$5,152.

CONCLUSION: We found significant quality and cost differences between OPCAB and PCAB-A when performed by an experienced surgeon. OPCAB can be more or equally effective and cost-friendly when performed by experienced surgeons on the appropriate patient population.

Autonomic Dysfunction in COVID-19: Early Detection and Prediction Using Heart Rate Variability

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INTRODUCTION: Heart Rate Variability (HRV) is a normal function of neuronal and cardiac interactions and is necessary for rapidly changes in physiologic hemodynamics. This study is to determine the changes in HRV using a machine learning algorithm with COVID-19 pneumonia.

METHODS: A retrospective, single center analysis of 200 patient electrocardiograms who presented to our emergency room and admitted with a COVID-19 PCR test using approved protocol (IRB#2020436). Patients were classified into four groups: symptomatic COVID-19 positive group (COVID-19+), asymptomatic COVID-19 patients with silent hypoxia (shCOVID-19), COVID-19 negative and asymptomatic with silent hypoxia (N-Control), and COVID-19 negative symptomatic patients (P-Control). Ten second lead II ECG waveforms were subject to algorithmic R-Wave detection and outlier analysis. Root mean square of successive differences between normal heartbeats (RMSSD), the standard deviation of normal-to-normal RR-intervals (SDNN), and HRV triangular index were all calculated based upon standard definitions using customized scripts executed in Matlab 2020b. Population means were compared through an analysis of variance.

RESULTS: There was a significant difference between RMSSD, SDNN, and HRV triangular index when comparing COVID-19 negative to COVID-19 positive patients ($p < 0.01$). There was a trend towards significance when comparing shCOVID-19 HRV

to COVID-19+ HRV RMSSD, SDNN, and HRV Triangular index.

CONCLUSION: Autonomic dysfunction is present in COVID-19 patients. HRV can be used for early detection and prediction of COVID-19 allowing physicians to intervene earlier to reduce its morbidity and mortality.

Do Surgical Outcomes for Ascending Aortic Dissection Vary Based on Arterial Cannulation?

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INTRODUCTION: The optimal method for arterial cannulation in acute aortic dissection surgical repair remains controversial. The aim of this study was to compare central ascending aortic, axillary, and femoral cannulation in patients who underwent surgery for acute ascending aortic dissection.

METHODS: A retrospective study was performed on 111 patients who underwent surgical repair for a Type A dissection between January 1st, 2011 and September 11th, 2019 at a single institution. A total of 116 arterial cannulations were performed. These consisted of 83 (71.6%) femoral, 16 (13.8%) ascending aorta, and 17 (14.7%) axillary cannulations. Deep hypothermic circulatory arrest was used in all the patients. Rates of postoperative complications and mortality were reported.

RESULTS: The mortality rate for all patients undergoing repair of the Type A dissections was 26.1% (29/111), with no difference observed between those undergoing femoral, axillary, ascending aorta cannulations (26.8%, 20.0%, 28.6%, respectively; $p=0.88$). None of the mortalities identified were directly attributable to the cannulation approach in each case. There was no statistically significant difference in rates of malperfusion directly due to cannulation strategy (1.2% femoral, 5.8% axillary, 6.3% ascending aorta; $p=0.19$). Similarly, there was no difference in bleeding rates at the site of cannulation (1.2% femoral, 0% axillary, 0% ascending aorta; $p=1$).

CONCLUSION: Despite the recent shift away from femoral cannulation, the results of the study show that all 3 cannulation techniques are safe and produce excellent results for establishing cardiopulmonary bypass. The concerns for malperfusion syndrome related to femoral cannulation were not seen.

Gradual Oxygen Reexposure Improves Outcomes During Cabg for Acute Myocardial Infarction

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INTRODUCTION: We compared mortality, post MI LV function, rehospitalization for CHF or ICD in patients undergoing emergency bypass surgery (CABG); exposed to hyperoxia vs gradual oxygen.

METHODS: We reviewed records of emergency CABG over an eight year period. After 2010 we instituted a gradual oxygenation (GO group) protocol in a non-randomized manner. Patients were excluded who presented electively. End-points were operative mortality, deterioration of left ventricular ejection fraction (LVEF) as assessed by echocardiography (echo) and readmission for or ambulatory treatment of congestive heart failure or insertion of an implantable cardioverter defibrillator (ICD).

RESULTS: 64 patients (23 in the HO group and 41 in the GO group) were included. Unadjusted operative mortality and in those with shock was lower in the GO group (0/41 0% vs 3/23 13%; $p=0.0425$) and (0/9 0% vs 3/7 42.9% $p=0.0625$) respectively. Absolute LVEF deteriorated (≤ 5 -10%) less often in the GO group (1/41 2.4% vs 12/23 52.2% $p<0.0001$) and LVEF improved at one year in the GO group vs. deteriorating in the HO group (-0.6 % vs. +7.7% $p=0.0305$). Readmission within one year was lower in the GO group (3/41 7.3% vs 8/23 34.7% $p=0.01$). Inpatient or outpatient treatment for systolic heart failure or requirement for ICD was also less frequent (2/41 4.8% vs 9/23 39.1% $p=0.02$).

CONCLUSION: Patients undergoing emergency CABG had improved survival and better cardiac recovery with controlled oxygen re-exposure. This reduces heart failure, readmission and ICD compared to hyperoxia in surgery. More prospective work is required.

Systematic Review of Graft Patency after Robotically Assisted Coronary Artery Bypass Grafting Surgery

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INTRODUCTION: Robotically assisted coronary artery bypass grafting surgery (RACABG) avoids the morbidities of a sternotomy and cardiopulmonary bypass and is becoming increasingly popular. Robotically assisted minimally invasive direct CABG (RMIDCAB) and totally endoscopic CABG (TECAB) have been shown to have similar patency rates compared to conventional CABG (Left internal mammary artery patency: 98%, 95%, 88% at 5, 10 and 15 years, respectively). A systematic review was performed to evaluate graft patency and clinical outcomes in patients who underwent RACABG.