

Comprehensive Enhanced Recovery after Cardio-Thoracic Surgery: A Case-Series to Analyze Feasibility and Patient Outcomes

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What is ERAS?

- Multimodal, evidence-based approach designed to standardize medical care, improve outcomes and lower health care costs by:
 - Blunting the physiologic stress response to surgical insult
 - Avoiding delayed recovery associated with traditional care
- Initially developed in Northern Europe in 2001 in the context of colon resections



Purpose

- To further evaluate the feasibility of ERAS in cardiac patients
- Design : Retrospective case review
- Setting: Single-Center study
- Participants: Patients undergoing elective cardiac surgery limited to on pump coronary artery bypass graft



Standard of Care

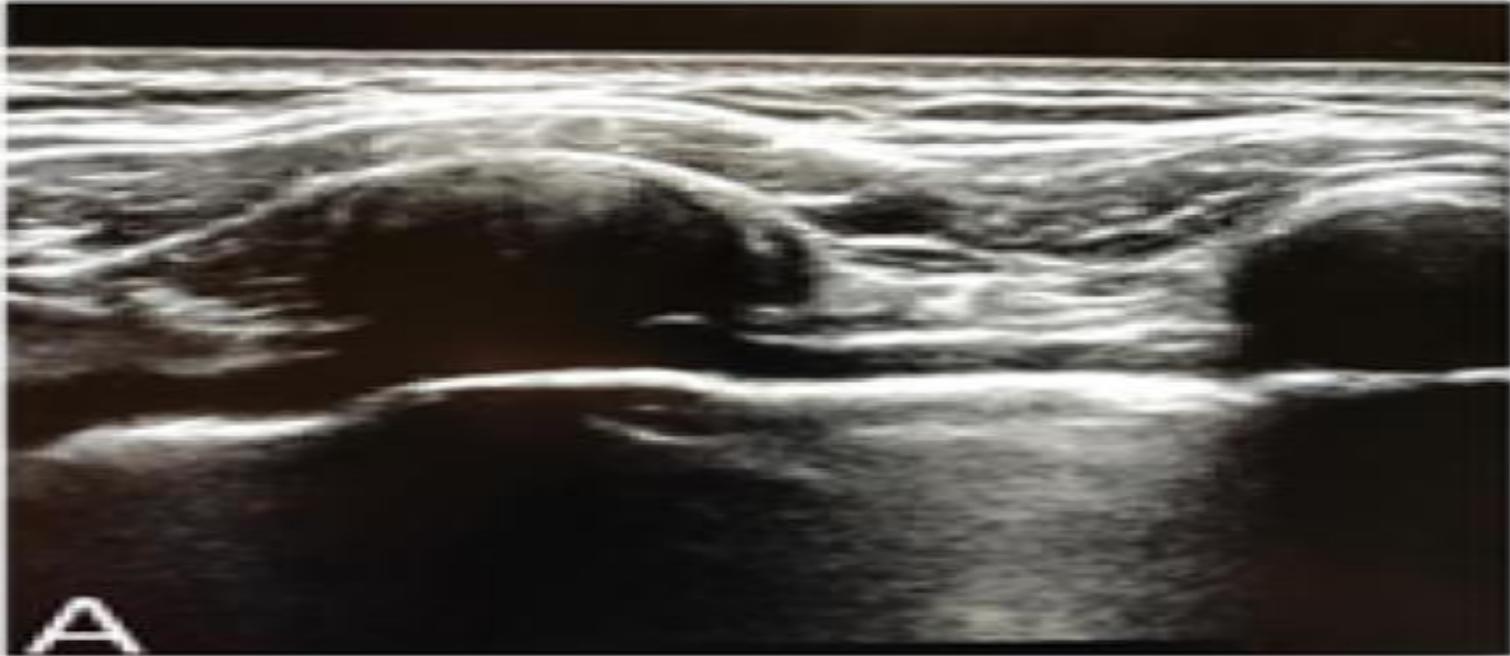
- Preoperative assessment by anesthesiologist
- Midazolam 0.02mg/kg IV pre-op
- Induction and intubation with propofol, fentanyl, rocuronium (0.6-1.2 mg/kg)
- Standard ASA monitors, continuous arterial BP, CVP, PAP monitoring
- Insertion of TEE probe
- Maintenance with volatile anesthetic and fentanyl
- Standard pharmacologic optimization with inotropes, beta blockade, fluids.
- Post op to CVICU intubated (ext within 6 hrs)
- Post op pain - PCA, tramadol, tylenol with codeine.



ERAS Bundle

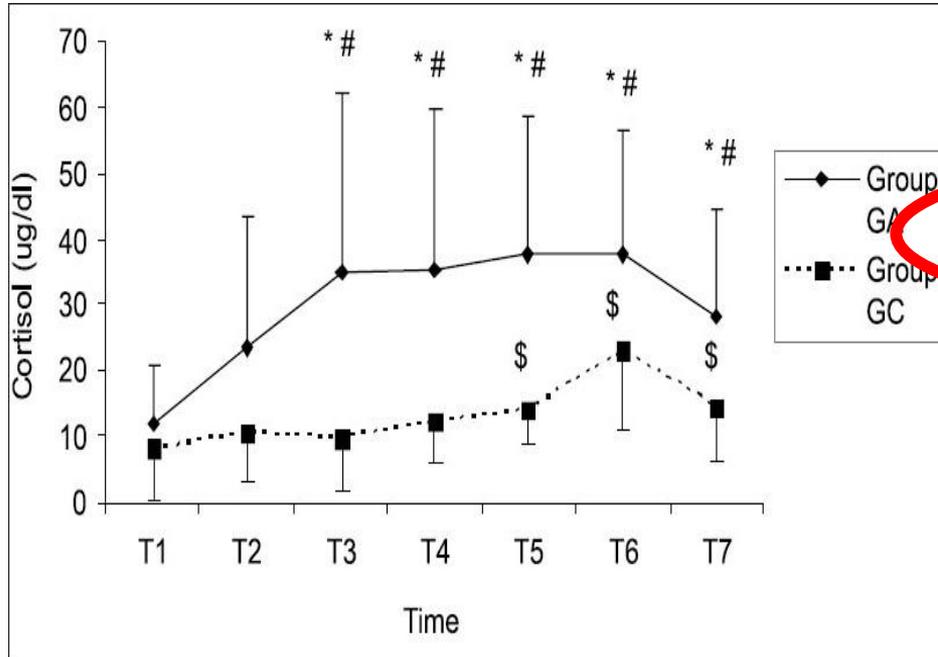
- **In addition to standard of care**
- Gabapentin 300 mg PO, preoperatively
- Bilateral transverse thoracic plane block *(prior to incision)
- Left serratus anterior plane block
- Left adductor canal block
- Minimization of PAC use
- Dexmedetomidine infusion (0.3-0.5 mcg/kg/hr)
- Ofirmev at sternal closure
- Neuromuscular blockade reversal
- Goal of OR extubation
- Post op gabapentin 300 mg PO with standard post op pain management
- Bed to chair within 3 hours of arrival

US Transverse Thoracic Plane Block



**Figure A: Parasternal plane block. Fig
minutes post-block.**

Caudal epidural sufentanil and bupivacaine decreases stress response in pediatric cardiac surgery



Variable	Group GA	Group GC	P value
Cortisol (ug/dl)			
Induction (T1)	11.81 ± 11.90	8.3 ± 8.7	0.137
Before incision (T2)	23.52 ± 23.12	10.32 ± 7.3	0.2
Post sternotomy (T3)	34.74 ± 27.35	9.8 ± 7.5	0.045*
CPB (T4)	35.36 ± 24.15	12.17 ± 6.2	0.003*
Sternal closure (T5)	37.62 ± 20.69	14.03 ± 5.1	0.001*
Postoperative 4 hours (T6)	37.62 ± 9.13	26.64 ± 14.61	0.019*
Postoperative 24 hours (T7)	28.12 ± 16.31	14.30 ± 8.11	0.002*
Glucose (mg/dl)			
Induction (T1)	144.88 ± 48.28	168.73 ± 33.40	0.62
Before incision (T2)	157.86 ± 56.93	120.00 ± 35.63	0.05
Post sternotomy (T3)	163.46 ± 99.36	139.93 ± 41.17	0.8
CPB (T4)	216.86 ± 94.13	155.93 ± 34.74	0.06
Sternal closure (T5)	277.46 ± 77.25	197.73 ± 42.17	0.002*
Postoperative 4 hours (T6)	255.26 ± 73.73	185.26 ± 57.41	0.007*
Postoperative 24 hours (T7)	178.46 ± 100.60	136.80 ± 38.08	0.15

Values are mean ± SD; **P* < 0.05, (GA vs. GC group); CPB = Cardiopulmonary bypass



Patient Data

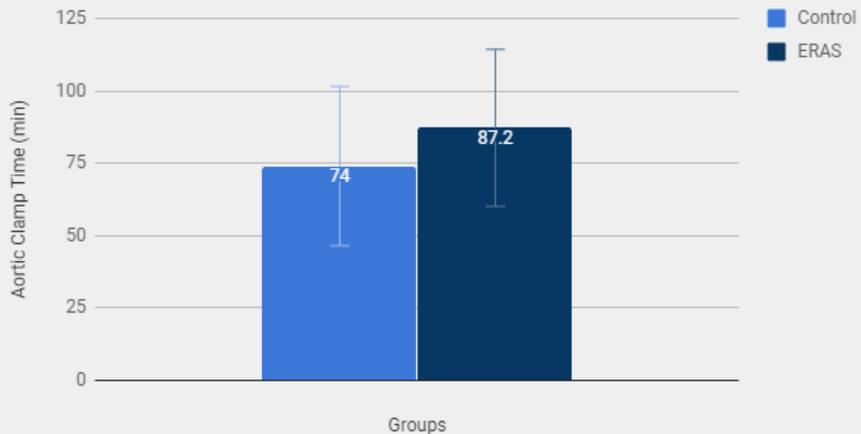
	ERAS	Control	P value
N	25	25	
Age, mean \pm SD	64.3 \pm 12.0	66.6 \pm 10.3	0.48
Male sex	18 (72%)	20 (80%)	0.74
Weight (kg), mean \pm SD	86.3 \pm 26.3	86.1 \pm 25.9	0.98
Height (cm), mean \pm SD	170.3 \pm 10.9	170.4 \pm 8.3	0.96
BMI, mean \pm SD	29.7 \pm 8.0	29.5 \pm 8.5	0.96
Comorb burden, median (IQR)	4 (3, 5)	3 (3, 4)	0.098
Comorb burden			0.15
1	0 (0%)	2 (8%)	
2	2 (8%)	3 (12%)	
3	6 (24%)	9 (36%)	
4	9 (36%)	7 (28%)	
5	5 (20%)	0 (0%)	
6	3 (12%)	4 (16%)	
Vessels			0.37
2	5 (20%)	4 (16%)	
3	7 (28%)	12 (48%)	
4	13 (52%)	9 (36%)	



Results Cont'd

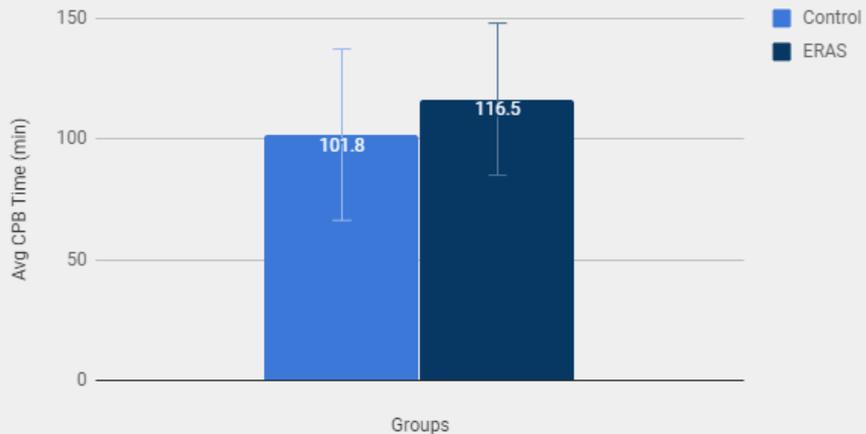
Control VS ERAS - Avg Aortic Clamp Time

P-value = 0.098



Control VS ERAS Cardiac Bypass Time

P-value = 0.13

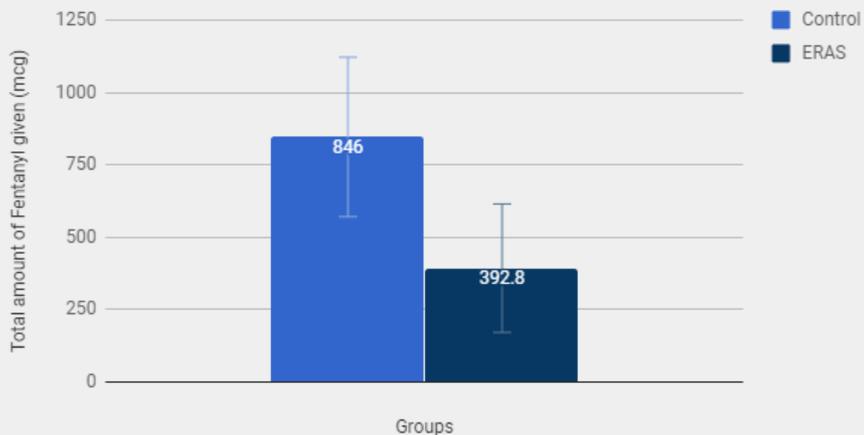




Results

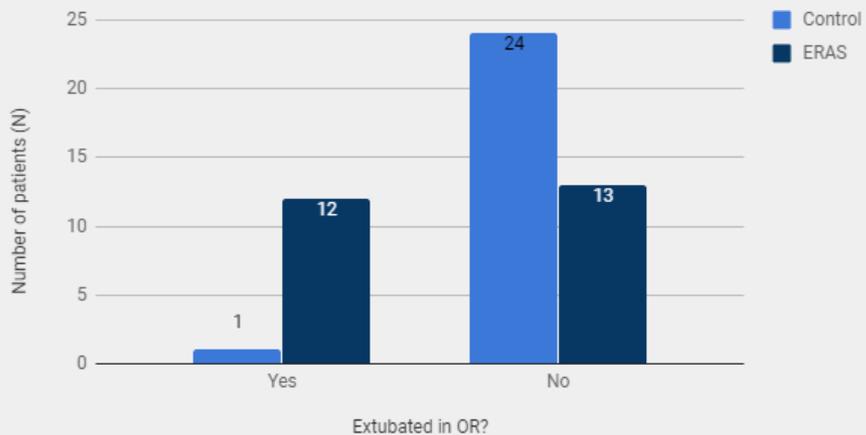
Control VS ERAS - Total Fentanyl Given (mcg)

P-value <0.001

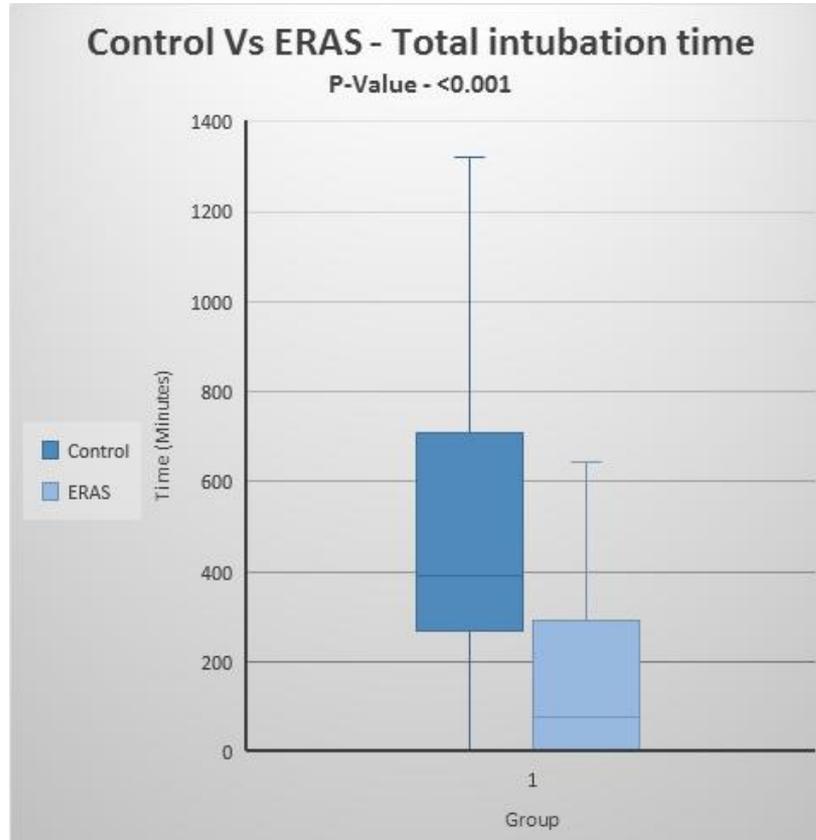


Control VS ERAS - In-OR Extubation

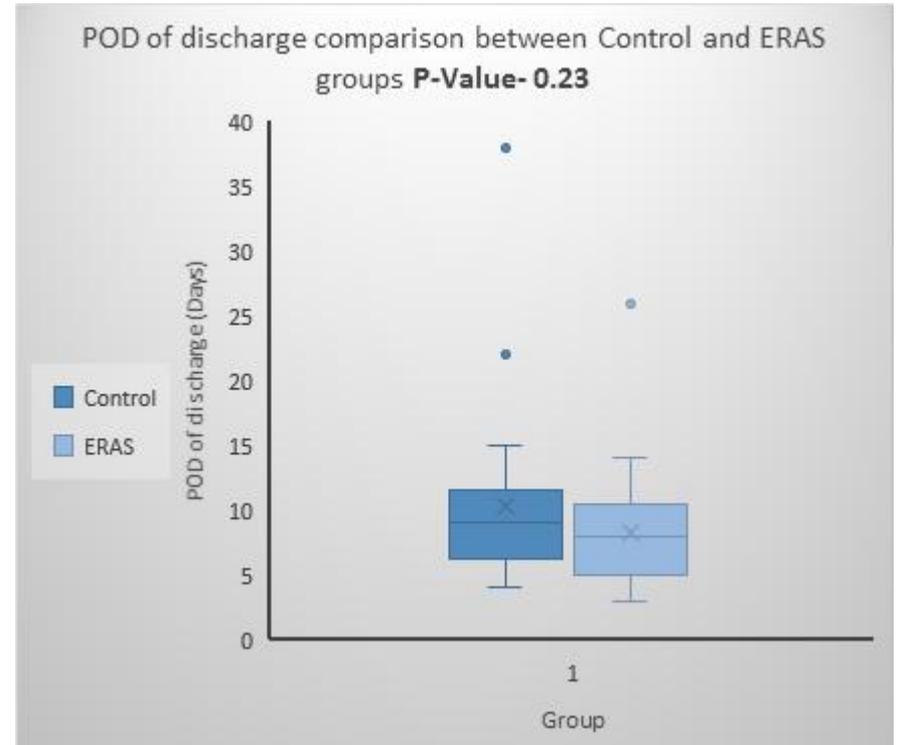
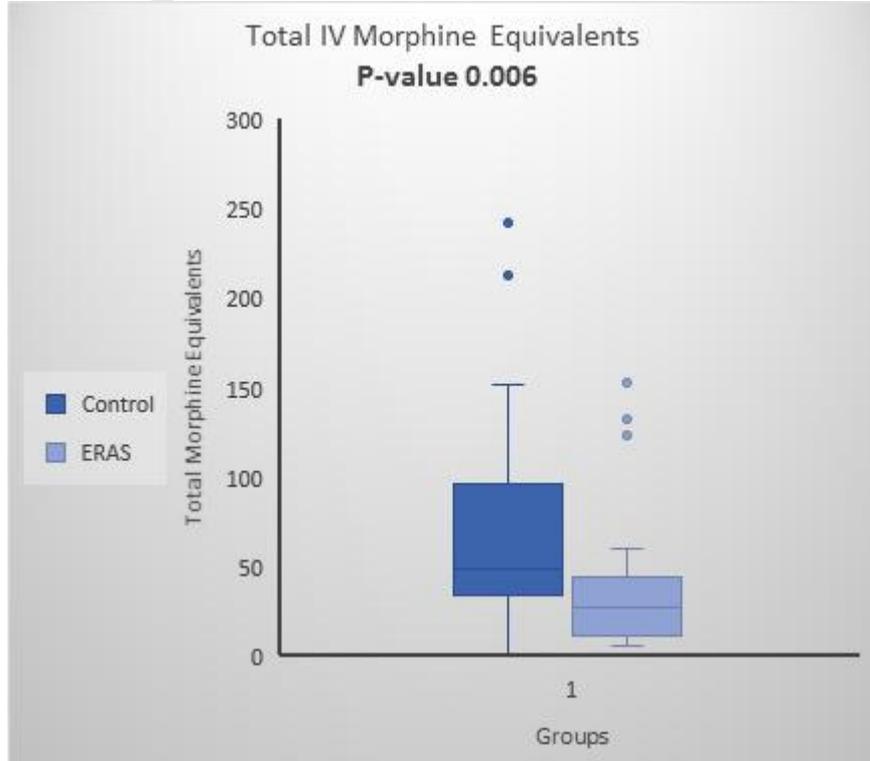
P-value <0.001



Results Cont'd



Results Cont'd





Discussion

- Utilization of peri-operative multimodal analgesia in the form of preoperative gabapentin, pre-incisional regional anesthesia techniques, dexmedetomidine infusion, and acetaminophen in cardiac patients.
- Statistically significant reduction in opioid consumption
- Decreased time of intubation and increased in-OR extubations
- Absolute difference in AVG POD discharge of 1.9 days, but no statistical significance in median POD of discharge
- Initial feasibility study shows positive trends with a desire to revise the current ERAS protocol with application to a larger patient population.