Comparing the Addition of Multimodal Pain Medications, Ketamine and Dexmedetomidine, to Erector Spinae Plane Nerve Block (ESP) for Cardiac Surgery versus Opioids for Pain Control

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Background

For decades, cardiac surgery has been completed under general anesthesia requiring moderate to heavy doses of opioids. In recent years, anesthesiologists have adopted "Enhanced Recovery after Surgery" (ERAS) protocols to facilitate rapid recovery and minimize perioperative complications associated with opioids. There is currently a paucity in data regarding the benefits of regional anesthetic techniques in cardiac surgery, however recent literature has suggested that multimodal analgesic modalities, including the Erector spinae plane (ESP) block via ERAS protocols have been adopted into cardiac surgery with positive results.

Objectives

1. Compare the clinical outcomes of using ESP to patients who did not have ESP during cardiac surgery.
2. Compare ESP patients who received multi-modal pain medication to those who received only opioids

Methods

This is a retrospective observational study of 163 cardiac surgeries between 7/1/2020 to 12/31/2022. Patients were grouped by whether or not they received a regional erector spinae plane (ESP) block or not. The ESP group was used for a sub-analysis to compare those who received minimal opioid doses and multimodal analgesics to those who received moderate to high doses of opioids for pain without alternative analgesic agents. In both analyses, the clinical outcomes of interest are post-operative time to extubation, length of ICU stay, acute renal failure, and both intra-operative and post-operative total opioid dose (in MME) for both sets of analyses.

Variable	ESP Block	No Block	P-value
MME per hour (Intraop), median (IQR)	12.9 (8.9, 26.1)	51.8 (38.1, 64.3)	<0.01
Ventilator hours, median (IQR)	4.3 (3.5, 6.0)	5.4 (3.8, 7.4)	0.03

Inclusion / Exclusion Criteria

Inclusion	Exclusion
• Male and female • Age – Greater than 18 and less than 89 • Isolated CABG surgery • Isolated 1 valve surgery • AVR/CABG • MVR/CABG	• Age – Age less than 18 and greater than 89 • Emergent cases • Multiple valves • Re-explorations

Statistical Methods, Analysis

Demographics of the study groups were compared using chi-square analyses for categorical variables (gender, race) or t-tests for continuous variables (age). The primary outcome of total opioid dose (mme) was compared using the Wilcoxon rank-sum test, as it was expected to be non-normal. The total post-operative opioid dose was adjusted for length of stay. Secondary outcomes of acute renal failure (Y/N), post-operative delirium (Y/N) was compared using chi-square analyses, and time to extubation (hours) and length of stay in ICU (hours) was compared using either t-tests or Wilcoxon rank-sum tests if the data is non-normal. A multivariate regression model will examine the relationship between total opioids (mme) and study group, and will include demographic variables, time to extubation, length of stay in ICU, and renal failure. Subgroup analyses (multimodal analgesics vs only opioid) was descriptive. Chi-square and t-tests was used to compare the two subgroups.
Results indicate there is a statistically significant difference (p=<0.0001) in intraoperative narcotics administered to patients (13 MMEs/hr vs 52 MMEs/hr).
Results indicate there is a statistically significant difference (p <0.0163) in number of ventilator hours patients were required to have (4.25 vent hrs vs 5.42 vent hrs).
There was no statistically significant difference in pain score between patients who received a block and who did not from first arriving to the ICU to hour 48 in the ICU.
Other parameters, such as length of ICU stay, acute renal failure, post operative total opioid dose were all statistically insignificant findings. The analysis of ESP block alone vs ESP block with alternative modalities resulted in no statistically significant difference in pain scores.

Discussion

Our findings indicate there is substantial benefit to considering erector spinae plane blocks as an alternative to high dose opioids for scheduled cardiac surgery, resulting in decreased time to extubation and reducing total narcotic doses intraoperatively. ESP block alone vs ESP block with alternative modalities resulted in no statistically significant difference in pain scores indicating there may be diminished benefit to these medications when an ESP block is employed.
Future studies should consider alternative block types or the presence of indwelling catheters versus single shot blocks for analgesic benefit in the ICU period.

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