



# The Association of a Novel Combination of Regional Anesthesia with Analgesic Outcomes Following Pediatric Cardiac Surgery

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## Background

- Use of regional anesthesia for perioperative pain management in children undergoing sternotomy for repair of congenital cardiac anomalies is an evolving field with a limited base of clinical evidence.
- The Pecto-Intercostal Fascial Block (PIFB) allows targeted blockade of the anterior cutaneous branches of the intercostal nerves supplying sensation to site of sternotomy<sup>1</sup> (Figure 1).

## Research Question

- In pediatric cardiac surgical patients, does a regional anesthesia strategy of bilateral intraoperative Pecto-Intercostal Fascial Blocks and a unilateral rectus sheath block (RSB) ipsilateral to the chest tube site reduce postoperative opioid consumption and pain scores when compared to surgeon-delivered local anesthetic infiltration?

## Methods

- Single-center, retrospective cohort study of children (age < 18) undergoing sternotomy for repair of ventricular septal defects (VSDs) or atrial septal defects (ASDs)
- Time period: 1/1/2018 – 10/31/2022
  - Standardized intraoperative opioid management protocol (IV methadone)
- Exposure: receipt of intraoperative bilateral PIFBs and unilateral RSB
  - Department-wide incorporation of PIFB/RSB approach in 6/2021
  - "Quasi-randomized" allocation of intervention based on practice change
- Outcomes:
  - Postoperative opioid consumption (oral morphine milligram equivalents per kilogram [OME/kg]) at 12, 24, and 48 hours
  - Postoperative pain scores at 12, 24, and 48 hours
  - Hospital length of stay and time under general anesthesia
- Statistical analysis:
  - Primary analysis: propensity score weighted models using overlap weights to account for bias in treatment allocation and imbalance in covariates across cohorts<sup>2</sup>
  - Three sensitivity analyses to confirm stability of results to analytic approach: (1) propensity score weighting using inverse probability of treatment weights, (2) unweighted, unadjusted models, and (3) unweighted, fully adjusted models

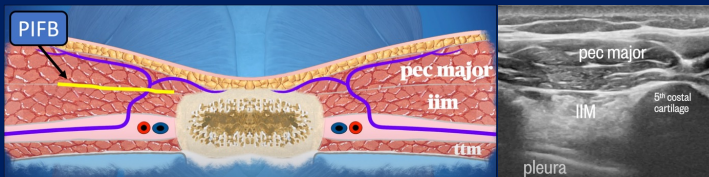


Figure 1: Diagrammatic and sonographic anatomy of the PIFB (diagram by Jeff Gadsden, MD)

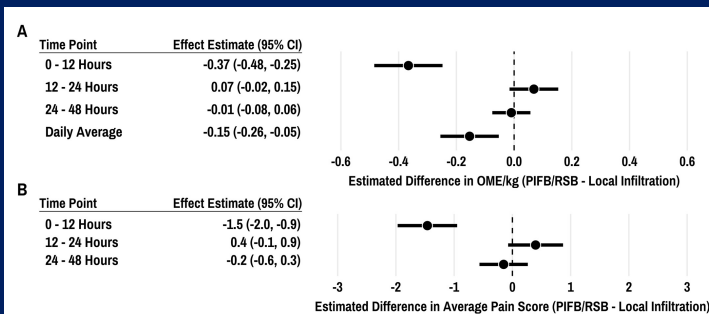


Figure 2. Effect estimates for opioid requirements (A) and patient-reported pain scores (B) from propensity score weighted models. Black circles represent point estimates and interval bars represent 95% confidence intervals. Negative values indicate reduced opioid consumption and pain scores in the PIFB/RSB group compared to the local infiltration group.

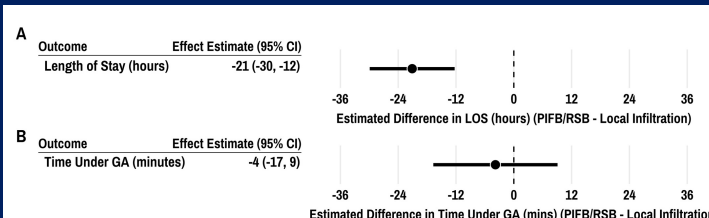


Figure 3. Effect estimates for length of stay (A) and time under general anesthesia (B) from propensity score weighted models. Black circles represent point estimates and interval bars represent 95% confidence intervals. Negative values indicate reduced values in the PIFB/RSB group compared to the local infiltration group.

## Results

- 104 unique patients (local infiltration 64%, PIFB/RSB 36%)
- Significant reduction in opioid consumption and pain scores at 12-hours following surgery in patients receiving PIFB/RSB (Figure 2)
  - Subsequent equalization between groups for 24- and 48-hour time points
- Overall reduction in daily average opioid consumption across the entire hospitalization
- Reduction of hospital length of stay, no change in time under general anesthesia (Figure 3)
- Results remained consistent in their magnitude and direction of effect, and their level of uncertainty in all sensitivity analyses (Figure 4)

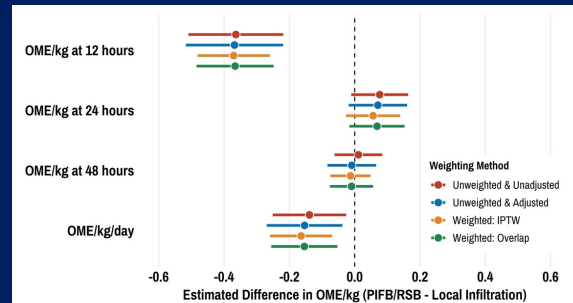


Figure 4. Sensitivity analysis comparing effect estimates for opioid requirements under various modeling strategies. Circles represent point estimates and interval bars represent 95% confidence intervals.

## Conclusions

- In this retrospective study, we find that use of bilateral PIFBs and a unilateral RSB as an analgesic technique for pediatric patients undergoing sternotomy for cardiac surgery is associated with a reduction in postoperative opioid utilization and pain scores without prolonging time under general anesthesia.
- A prospective, double-blind RCT with an active comparator is the next step in evaluating the effectiveness of this intervention.

## References

- de la Torre PA, et al. A novel ultrasound-guided block: a promising alternative for breast analgesia. *Aesthet Surg J*. 2014;34(1):198-200.
- Li F, Thomas LE, Li F. Addressing Extreme Propensity Scores via the Overlap Weights. *Am J Epidemiol*. 2019;188(1):250-257.