

Regional Analgesia Techniques as Adjuncts to General Anesthesia in Pediatric Cardiac Surgery: Updated Meta-analysis

👤Bruno F. M. Wegner, Gustavo R. M. Wegner, Gabriel L. González, Vitor Felipe, Alesson Marinho, Tatiana S. Nascimento, Archit Sharma

Introduction

- Regional anesthesia increasingly used in pediatric cardiac surgery
- Evidence heterogeneous and technique-specific
- Clinical value of overall RA effect unclear
- Objective: evaluate class effect of adjunctive RA on opioid use and recovery

Methods

- Databases: PubMed, Embase, Cochrane Library, Web of Science (from inception to July, 2025)
- Population: Pediatric patients undergoing cardiac surgery
- Intervention: Regional analgesia
- Comparator: General anesthesia alone
- Techniques: Neuraxial / Peripheral Nerve Blocks / Local Infiltration Analgesia
- Primary outcomes: intraoperative and 24-h opioid consumption
- Secondary: extubation time, ICU stay, time to rescue analgesia
- Certainty of evidence evaluated with GRADE



Scan to read our Abstract



Regional analgesia may enhance recovery and decrease opioid exposure in pediatric cardiac surgery

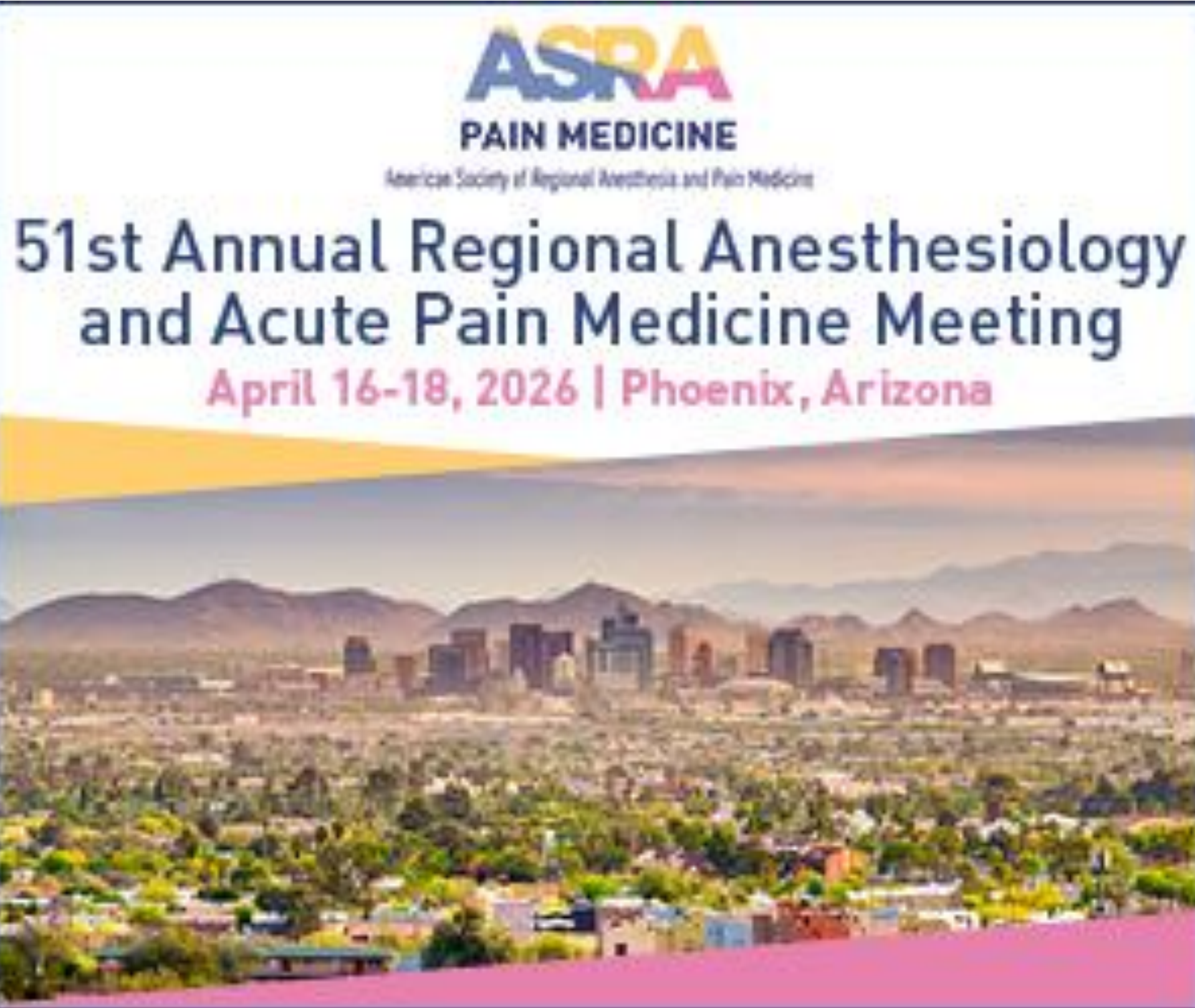
Intraoperative Opioid Consumption

Subgroup	N (RCTs)	Mean (95% CI)	95% PI	I²	P-value
Overall	1,644 (22 RCTs)	-2.50 µg/kg (-3.84 to -1.15)	-9.51 to 4.52	97%	0.0003
Pre Incisional Neuraxial Techniques	314 (7 RCTs)	-4.03 µg/kg (-10.31 a 2.25)	-26.80 to 18.74	94.8%	0.208
Pre Incisional Peripheral Nerve Block	1,031 (12 RCTs)	-3.44 µg/kg (-4.47 to -2.42)	-7.43 to 0.55	95%	0.0001
Postoperative Peripheral Nerve Block	57 (1 RCT)	3.28 µg/kg (-1.61 to 8.18)	-28.44 to 35.01	0%	0.137
Postoperative Local Infiltration Analgesia	242 (2 RCTs)	0.21 µg/kg (-0.07 to 0.48)	-0.39 to 0.81	6.5%	0.188

Postoperative Opioid Consumption

Subgroup	N (RCTs)	Mean (95% CI)	95% PI	I²	p-value
Overall	543 (9 RCTs)	-0.33 mg/kg (-0.55 to -0.11)	-1.17 to 0.51	96%	0.004
Pre Incisional Neuraxial Techniques	30 (1 RCT)	0.02 mg/kg (-0.19 to 0.23)	—	0%	0.848
Pre Incisional Peripheral Nerve Block	414 (6 RCTs)	-0.48 mg/kg (-0.79 to -0.17)	-1.60 to 0.64	97%	0.002
Postoperative Peripheral Nerve Block	27 (1 RCT)	-0.30 mg/kg (-0.38 to -0.22)	—	—	—
Postoperative Local Infiltration Analgesia	72 (1 RCT)	-0.15 mg/kg (-0.28 to -0.02)	—	—	—

N: Number of patients; CI: Confidence Interval; PI: Prediction Interval; RCT: Randomized Controlled Trial; µg/kg, micrograms of fentanyl equivalents per kilogram; mg/kg, IV morphine milligram equivalents per kilogram;



Results

- 31 RCTs (n = 2245)
- Reduced intraoperative fentanyl (MD −2.50 µg·kg^{−1})
- Reduced 24-h morphine (MD −0.33 mg·kg^{−1})
- Faster extubation (MD −1.72 h)
- Shorter ICU stay (MD −0.25 days)
- Longer time to rescue analgesia
- High heterogeneity across outcomes
- Effect most consistent with peripheral nerve blocks
- Neuraxial / infiltration → variable results
- Moderate–high heterogeneity
- Evidence certainty: very low to low

Conclusion

- RA associated with reduced opioid exposure and improved recovery
- Results limited by heterogeneity between techniques
- Safety profile incompletely defined
- Findings should be interpreted with caution

Registration

- PROSPERO CRD420251073543.