The Effectiveness of Intravenous Dexmedetomidine Compared to Other Intravenous Anesthetics in Reducing the Incidence of Delirium in Pediatric Patients Undergoing General Anesthesia for Cardiac Surgery: A Systematic Review

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REVIEW QUESTION

In pediatric patients undergoing general anesthesia for cardiac surgery, how does the use of dexmedetomidine, compared to other intravenous anesthetics, affect emergence delirium?

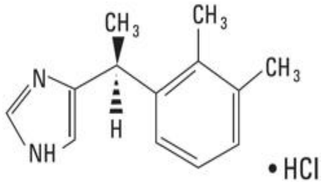
Objective: To systematically review and analyze the effectiveness of dexmedetomidine compared to other IV anesthetics in preventing emergence delirium (ED) in pediatric cardiac surgery patients

BACKGROUND

- Around 10,000 children require general anesthesia for cardiac defect repairs annually
- ED is defined as sudden perceptual disturbances and psychomotor agitation within 45 minutes of recovery from anesthesia
- The incidence of ED in children after anesthesia ranges from 10-80%
- The ideal anesthetic for patients undergoing cardiac surgery should maintain cardiovascular stability and have a favorable side effect profile including a low risk of perioperative delirium

Dexmedetomidine:

- Selective alpha-2 adrenergic agonist that works on the central nervous system to provide sedation, analgesia, and anxiolysis while maintaining cardiovascular function
- Literature has shown it to be a favorable anesthetic agent for prevention of ED in children



Point	Description of items	Not at all	Just a little	Quite a bit	Very much	Extremely
1	The child makes eye contact with the caregiver	4	3	2	1	0
2	The child's actions are purposeful	4	3	2	1	0
3	The child is aware of his/her surroundings	4	3	2	1	0
4	The child is restless	0	1	2	3	4
5	The child is inconsolable	0	1	2	3	4

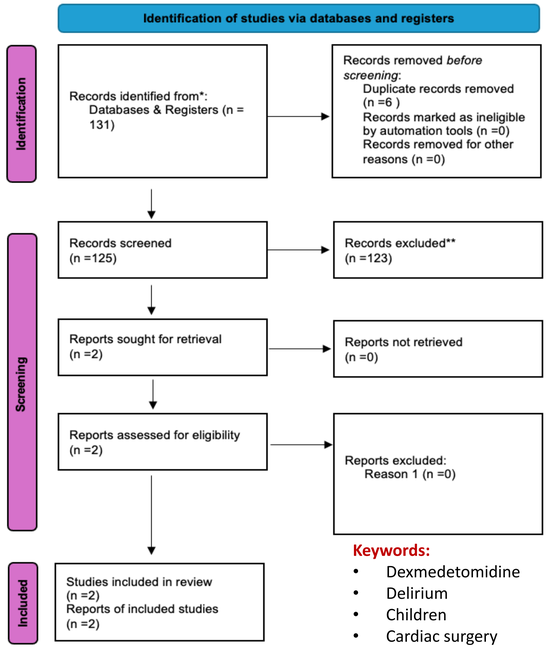
SIGNIFICANCE

- Children who develop ED suffer from short and long-term effects
- ED can result in falls, premature extubations, dislodgement of IV lines, increased length of stay, and family and patient dissatisfaction
- General anesthetic agents, most notably short-acting agents such as sevoflurane, often lead to emergence delirium in pediatric patients

METHODS

- **Study Design:** Systematic review and meta-analysis
- **Databases Searched:** MEDLINE (PubMed), Embase, Scopus, ProQuest Dissertation and Theses
- **Inclusion Criteria:** Children ages 0-18, history of heart disease (congenital or acquired), general anesthesia for cardiac surgery
- **Exclusion Criteria:** Over 18 years of age, pre-existing cognitive dysfunction
- **Intervention:** Perioperative administration of Dexmedetomidine
- **Comparators:** Propofol, ketamine, midazolam, fentanyl, 0.9% normal saline, and others

SEARCH STRATEGY



Keywords:

- Dexmedetomidine
- Delirium
- Children
- Cardiac surgery

CRITICAL APPRAISAL

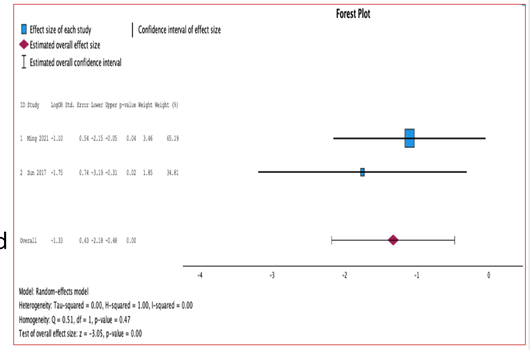
- Two RCTs were compiled into a table of evidence and reviewed by three independent reviewers
- Quality assessed using standard JBI critical appraisal checklist and deemed good quality

DATA EXTRACTION & SYNTHESIS

- Characteristics of the included studies were extracted and compared
- Participants in the intervention group received dexmedetomidine (varying doses), while participants in the comparison group received normal saline 0.9%
- The random effect model was utilized for meta-analysis
- Effect sizes expressed as odds ratio for categorical data
  - 95% confidence interval
- Heterogeneity was tested using chi-square test

RESULTS

- The overall odds ratio of -1.326 (95% CI -2.176 to -0.475) was statistically significant (p = 0.002), indicating that children in the dexmedetomidine group had a lower incidence of delirium
- Q-value of 0.513 indicated homogeneity
- I^2 value of 0 further confirmed no variability between the studies



DISCUSSION

- Previous literature has highlighted the role of dexmedetomidine in preventing ED in pediatric patients (Yang et al., 2020; Tang et al., 2024)
- Dexmedetomidine was found to reduce delirium for various general surgeries
- This review supports previous findings and enhances existing knowledge by exploring the use of dexmedetomidine in cardiac surgery

LIMITATIONS

Included studies had methodological flaws that could impact the validity of findings	Small number of studies, sample sizes limited	Studies were conducted in only one country	Limited sample and geographic focus may affect applicability of the results to broader patient population

RECOMMENDATIONS

- Further research is needed to define dexmedetomidine's role in preventing ED after pediatric cardiac surgery
- Research to optimize dosing regimens can balance efficacy and safety
- The development of standardized outcome measures for ED would facilitate better comparison across studies

CONCLUSION

- Dexmedetomidine may be effective for children and their families in preventing ED in pediatric patients undergoing cardiac surgery
- Clinicians should consider dexmedetomidine to improve the post-operative experience

REFERENCES

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