

01. Title: Effectiveness Of Methylene blue In Treating Vasoplegia Syndrome, a Systematic Review and Meta-analysis

Naba mahdi Ahmed¹

¹Sudan University of science and technology, faculty of medicine, Sudan

Background: Vasoplegic syndrome occurs in up to 25% of patients after cardiac surgery with cardiopulmonary bypass (CPB) and carries mortality >25% due to nitric oxide-mediated vasodilation and catecholamine resistance. Methylene blue (MB) inhibits guanylate cyclase and is used as rescue therapy, but evidence is limited to small studies. We conducted a systematic review and meta-analysis to evaluate the efficacy of methylene blue in treatment of cardiac surgery associated vasoplegia syndrome

Methods: We searched PubMed from inception to January 2026 for studies comparing intravenous methylene blue versus control in adults with post-cardiopulmonary resuscitation vasoplegia. Primary outcome was 30-day mortality. Secondary outcomes were vasopressor duration, ICU length of stay, and mean arterial pressure at 6 hours post-CPB. Risk of bias was assessed using RoB 2 and Newcastle-Ottawa Scale. Data were pooled using random-effects models. Certainty of evidence was assessed using GRADE.

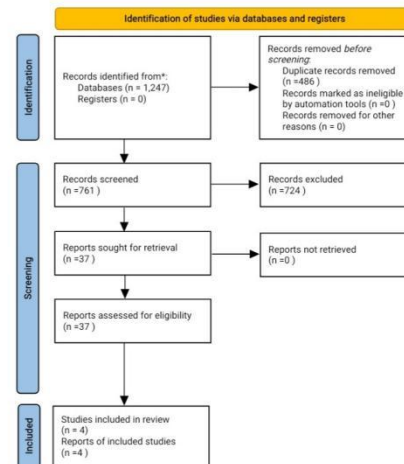
Results: Four studies with 472 patients (2 RCTs, 2 observational) met inclusion criteria. MB significantly reduced 30-day mortality (OR 0.40, 95% CI 0.26 to 0.63; $I^2 = 0\%$; moderate certainty), corresponding to 145 fewer deaths per 1,000 patients. MB also reduced vasopressor duration by 17.2 hours (95% CI -24.8 to -9.6; $I^2 = 42\%$; low certainty), ICU LOS by 1.7 days (95% CI -2.8 to -0.6; $I^2 = 58\%$; low certainty), and increased MAP at 6h by 15.0 mmHg (95% CI 9.0 to 21.0; $I^2 = 15\%$; low certainty). Mortality benefit was consistent for prophylactic and therapeutic administration.

Conclusions: In cardiac surgery-associated vasoplegic syndrome, methylene blue reduces 30-day mortality with moderate certainty and improves hemodynamic and resource utilization outcomes with low certainty. These findings support MB as rescue therapy while awaiting large RCTs to define optimal timing and dosing.

Key Words: Methylene blue; Vasoplegic syndrome; Cardiac surgery; Cardiopulmonary bypass; Meta-analysis; Mortality

Figure:

PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers only



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