Effectiveness of Nebulized Dexmedetomidine in Managing Post-Dural Puncture Headache in Obstetric Patients: A Systematic Review

Hassan Kiani[1], Sameera Khalid[1], Marium Kiwan[2], Gopakumar Nair[1], Cheng Lin[1], Alla Lansavitchene[1], Kamal Kumar[1]

1. Schulich School of Medicine and Dentistry, Western University, London, Ontario, Canada
2. Temerty Faculty of Medicine, University of Toronto, Toronto, Ontario, Canada

Schulich
MEDICINE & DENTISTRY

Background & Hypothesis

The Clinical Problem

Post-dural puncture headache (PDPH) is a debilitating complication driven by CSF leakage (1).

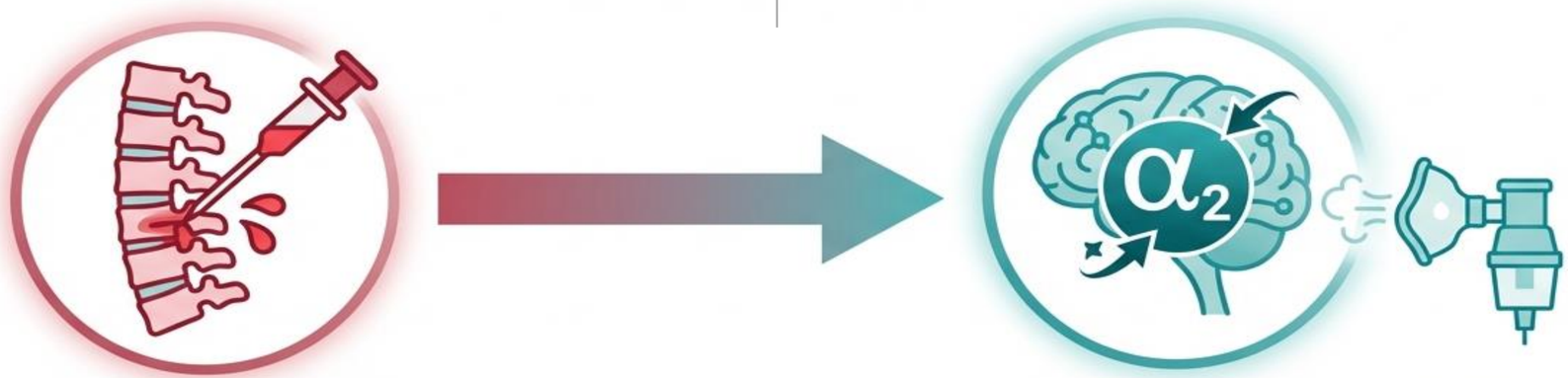
The Gold Standard: Epidural Blood Patch (EBP)

Risks: Back pain, radicular symptoms, bradycardia, meningeal irritation (1,2).

Hypothesis

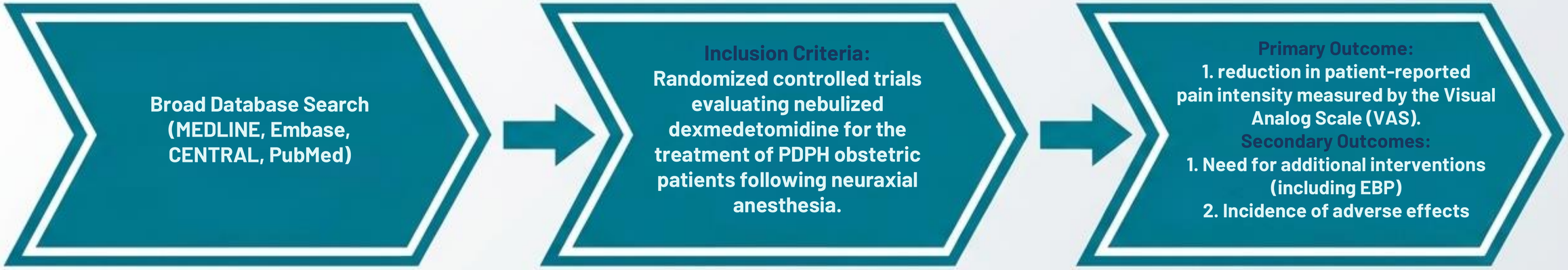
Nebulized dexmedetomidine reduces PDPH severity and may serve as a non-invasive alternative.

Mechanism: An a2-adrenergic agonist providing systemic analgesia, sedation, and cerebral vasoconstriction. (3)



Schulich
MEDICINE & DENTISTRY

Study Designs & Methods

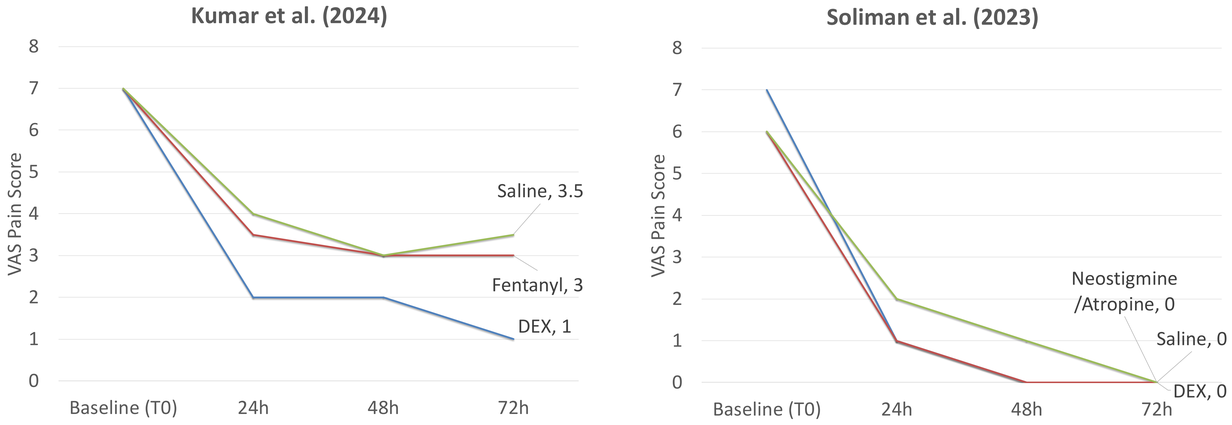


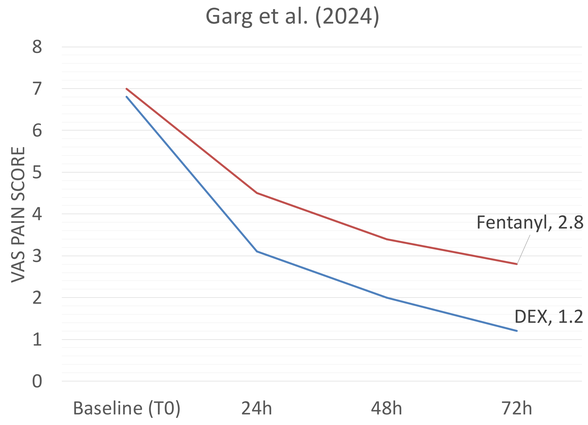
Study & Location	Patients	Intervention Dose	Comparators	Outcomes Tracked
Kumar et al. (4), India	n=90	1 µg/kg BID x 3 days	Fentanyl, Saline	VAS (24/48/72h), Adverse Events, EBP needed
Soliman et al. (5), Egypt	n=90	1 µg/kg BID x 3 days	Neostigmine/Atropine, Saline	VAS (24/48/72h), Adverse Events, EBP needed
Garg et al. (6), India	n=65	Not specified.	Fentanyl	VAS (24/48/72h), Adverse Events
Mowafy et al. (3), Egypt	n=43	1 µg/kg BID x 3 days OR until VAS ≤3 and Lybecker score <2	Saline	VAS (24/48/72h), Adverse Events, EBP needed

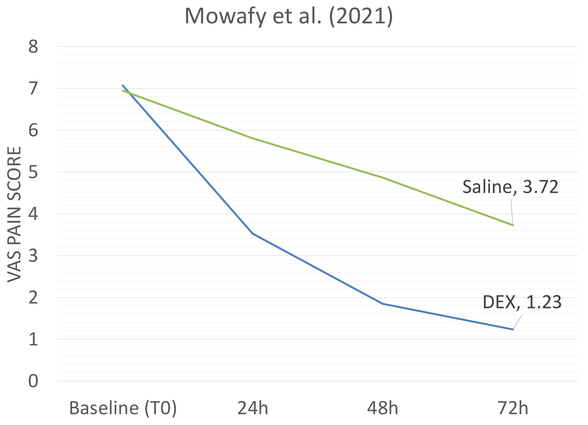
Cochrane Quality Assessment: Low overall risk of bias across pooled evidence

Schulich MEDICINE & DENTISTRY

Results







Across all RCTs, DEX consistently delivered superior pain control versus placebo and Fentanyl, and comparable with Neostigmine / Atropine.

Rescue Therapy Need

0 EBP

Across all 4 RCTs (n=92), zero patients in the DEX groups required an Epidural Blood Patch.

DEX: Primarily drowsiness/sedation, dry mouth, and bradycardia

Fentanyl: Primarily drowsiness, nausea, dizziness

Neostigmine/Atropine: Diarrhea, abdominal cramps, and muscle twitches

Schulich MEDICINE & DENTISTRY

Conclusion & Discussion

Nebulized dexmedetomidine appears to be a safe and effective non-invasive option for obstetric PDPH.

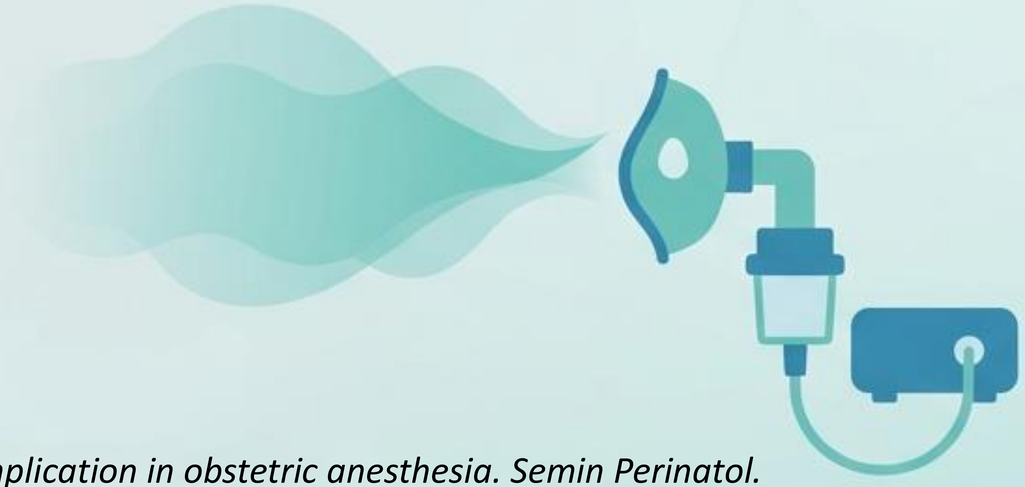
- Provides faster symptom relief to traditional pharmacological options (i.e., fentanyl), and comparable efficacy to neostigmine/atropine.
- Limited need for adjunctive treatments, including no need for EBP.
- Tolerable side effects similar in incidence with comparators.

Clinical Strengths	Evidentiary Limitations
• Non-invasive administration. • Consistent efficacy established at 1 µg/kg dose diluted to 4 mL. • Enhances systemic bioavailability by bypassing first-pass metabolism, no need for intravenous access.	• VAS in inherently subjective. • Off-label status for nebulized administration in North America. • Evidence is limited to PDPH following spinal anesthesia for LSCS and has not been studied in epidural-related PDPH.

Next Steps: Larger, multicenter trials are needed to validate these findings and to better define its role in the routine prevention and treatment of PDPH.

Schulich MEDICINE & DENTISTRY

THANK YOU!



References:

1. *Sachs A, Smiley R. Post-dural puncture headache: The worst common complication in obstetric anesthesia. Semin Perinatol. 2014 Oct;38(6):386–94.*
2. *Oh J, Camann W. Severe, acute meningeal irritative reaction after epidural blood patch. Anesth Analg. 1998;87:1139-40.*
3. *Mowafy SMS, Ellatif SEA. Effectiveness of nebulized dexmedetomidine for treatment of post-dural puncture headache in parturients undergoing elective cesarean section under spinal anesthesia: a randomized controlled study. Journal of anesthesia. 2021;35(4):515–24.*
4. *Kumar A, Sinha C, Singh K, Anant M, Kumar A, Kumari P. Comparative evaluation of nebulised dexmedetomidine vs fentanyl for the treatment of post-dural puncture headache (PDPH) in parturients after caesarean section under spinal anaesthesia: A randomised controlled study. Indian journal of anaesthesia. 2024;68(2):159–64.*
5. *Soliman OM, Aboulfotouh AI, Abdelhafez AM, Abedalmohsen A. Nebulized dexmedetomidine versus neostigmine/atropine for treating post-dural puncture headache after cesarean section: a double-blind randomized controlled trial. Minerva anestesiologica. 2023;89(10):867–75.*
6. *Garg R., Singh P.K., Kumar K. Comparative Study of Nebulized Dexmedetomidine versus Fentanyl for Treating Post-Dural Puncture Headache in Parturients Following Caesarean Section under Spinal Anesthesia a Randomized Controlled Trial Study. International Journal of Pharmaceutical and Clinical Research. 2024;16(4):1329EP – 1332.*

Schulich
MEDICINE & DENTISTRY