Efficacy, Safety, and Routes of Dexmedetomidine as an Adjunct for Regional Anesthetic Peripheral Nerve Blocks: A Comprehensive Literature Review.

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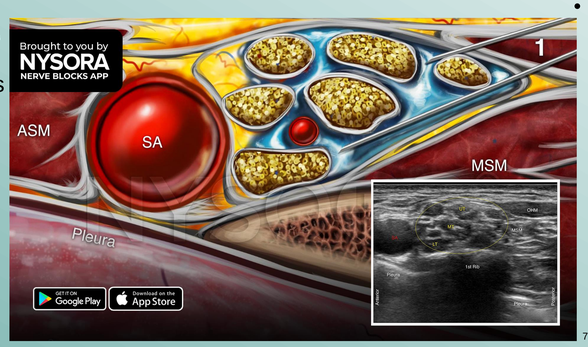
Introduction and Background

Effective pain management in the intraoperative and postoperative period is critical to patient outcomes. Administering upper extremity regional anesthesia allows for adequate analgesia, which leads to a reduction in opioid consumption, the general anesthesia requirement, and the possibility for chronic postoperative pain. The goal when completing regional anesthesia is to provide either sensory blockade or a combination of sensory and motor blockade while minimizing total opioid consumption. A reduction in opioid consumption reduces nausea and vomiting, respiratory depression, and pruritus[3]. Adjuncts can be used in regional anesthesia to prolong the effects of a block. This comprehensive literature review aims to assess the safety, efficacy, and routes of dexmedetomidine as an adjunct for regional nerve blocks.

- **Dexmedetomidine**
  - Can be utilized as an adjunct systemically (IV) or perineural.
  - Highly selective **α2-adrenoceptor agonist** used to decrease sympathetic tone, reduce anesthetic and opioid requirements, and to aid in sedation and analgesia while preserving psychomotor function[4]
  - Side Effects: mild to moderate cardiovascular depression such as a decrease in heart rate and blood pressure.



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Objective

Comprehensive review of current literature outlining efficacy, safety, and routes of dexmedetomidine when used as an adjunct to regional anesthesia peripheral nerve blocks prolongation in adults.

Methods: Literature Search

Search Terms: (dexmedetomidine or precedex), (adjunct), (perineural), (systemic), and (regional anesthesia), filtered by 2013-2023.
Data Sources: PubMed Central, Cochrane, Google Scholar
Study Selection Criteria: Randomized Controlled Trial (RCT), adult (18-65), ASA I-III, long-acting LA (levobupivacaine, bupivacaine or ropivacaine), upper extremity or intercostal nerve blocks using ultrasound guidance, sample size > 20.
Variables: Route of administration (perineural, systemic, control), duration of sensory and/or motor blockade, and dexmedetomidine related adverse effects.
Retrieved 32 articles, 6 Articles Included, 26 Excluded

Results

Study	Sample Size	Route and Type of Block	Results on Duration	Adverse Events
Sane et al. 2021[1]	N= 60	Perineural vs. Control Supraclavicular Block	**Perineural** Sensory: Y (+ 2.36 h) Motor: Y (+ 2.85 h)	None
Abdallah et al. 2016[2]	N= 99	Perineural, Systemic, vs. Control Interscalene Block	**Perineural and Systemic** Sensory: Y (P: + 4.2 h) (IV: + 3.1 h) Motor: N Perineural = Systemic	None
Luan et al. 2023[3]	N= 44	Perineural vs. Control Interscalene Block	**Perineural** Sensory: Y (+ 3.3 h) Motor: N	Not Included
Bao et al. 2022[4]	N= 60	Perineural, Systemic, vs. Control Triple Nerve Mid Forearm Block.	**Perineural** Sensory: Y (+ 3.34 h) ; Motor: Y (+ 2.41 h) **Systemic** Sensory: N ; Motor: Y (+ 2.41 h) Perineural > Systemic	Perineural & Systemic: reduced blood pressure and heart rate.
Reddy et al. 2021[5]	N=120	Perineural, Systemic, vs Control. Supraclavicular Block.	**Perineural & Systemic** Sensory: Y (P: + 5.07 h) (IV: + 2.07 h) Motor: Y (P: +4.78 h) (IV: + 2.42 h) perineural > systemic	None
Yao et al. 2020[6]	N=150	Perineural, Systemic, vs Control. Intercostal Nerve Block.	**Perineural & Systemic** Sensory: Y (P: + 7.1 h) (IV: + 1.9 h) perineural > systemic	None

Discussion

From our research we recognize that additional adjuncts can be used to prolong the effects of a block such as:

- decadron
- clonidine
- buprenorphine
- tramadol
- sodium bicarbonate
- epinephrine
- magnesium

Additional research needs to be completed to determine which adjunct prolongs the effects of regional analgesia while minimizing side effects related to the use of certain adjuncts. The duration of prolongation for the adjuncts above varies significantly in literature, further complicating ASRAs recommendation of one over another.

Conclusion

This comprehensive literature review reveals that the use of both systemic and perineural dexmedetomidine were observed to prolong sensory blockade and in some studies motor blockade.

- The extent of blockade prolongation was variable between perineural and systemic, with neither route showing superiority consistently.
- The adverse effects often seen in perioperative use of dexmedetomidine were only seen in one of the six studies.

- **The ASRA does not currently approve or recommend any adjunct in regional anesthesia prolongation due the inconsistent results of the low quality and clinical heterogeneity of published trials.[7]**

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