A CHALLENGING CASE- DEXMEDETOMIDINE FOR THE MANAGEMENT OF ACUTE POST-OPERATIVE PAIN

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Introduction

- **Dexmedetomidine** is a centrally acting alpha 2 adrenergic agonist approved for procedural sedation and for sedation in ICU patients for up to 24 hours.
- Emerging evidence supports its use in reducing opioid consumption (1,2), as an adjunct in regional anesthesia (3) and preventing emergence delirium (4).
- We report the use of dexmedetomidine for the management of **acute post-operative pain**.
- The patient has consented to the reporting and publication of this case report.

Case Report

- 35-year-old male, ATV accident, **compound crush injury** to his right leg. Complicated by wound infection, sepsis and rhabdomyolysis. Multiple surgeries and eventual amputation of the limb.
- **Acute Pain Service (APS)** started with hydromorphone (HM) IVPCA and oral multimodal analgesia protocol of acetaminophen, celecoxib, tramadol and pregabalin.
- During next 10 days (and 5 surgeries), his pain scores and opioid requirements increased considerably. Despite maximal multimodal analgesic use and appropriate PCA settings, daily requirements=1000mg OME.
- PCA changed to a **hydromorphone-ketamine** combination (HM 0.5 mg/ml + Ketamine 2mg/ml), programmed as HM- bolus 0.5mg, lock out 6min, continuous 1mg/ hr and 5mg hourly limit.
- By his 12th day, he suffered recurrent **acute pain crises**, and despite further supplemental opioids his **pain was uncontrolled**.
- Pain described as excruciating, burning, shooting and associated with extreme distress and agitation.
- The APS tried a **lidocaine** infusion- it was not well tolerated and did not reduce the pain- thus it was discontinued.
- In a **fully monitored** Trauma Unit, he was administered **1mcg/kg bolus** of **dexmedetomidine**. He reported a **reduction in pain scores** to 4/10.
- An infusion of **dexmedetomidine** was initiated **(0.4 mcg/kg/hr)** and the patient remained stable and comfortable and continued for 24hours.
- Oral clonidine added and titrated up to 0.2mg po tid.
- His next surgery was done with an epidural, which was continued for 7 days then removed, resulting in **pain crisis** again!
- Dexmedetomidine restarted and continued for 3 days with monitoring, pain scores and opioid requirements reduced gradually. The infusion range was **0.1- 0.4 mcg/kg/hr**.
- Pain was stabilized and controlled with multimodal oral analgesics until discharge to the rehabilitation institution.

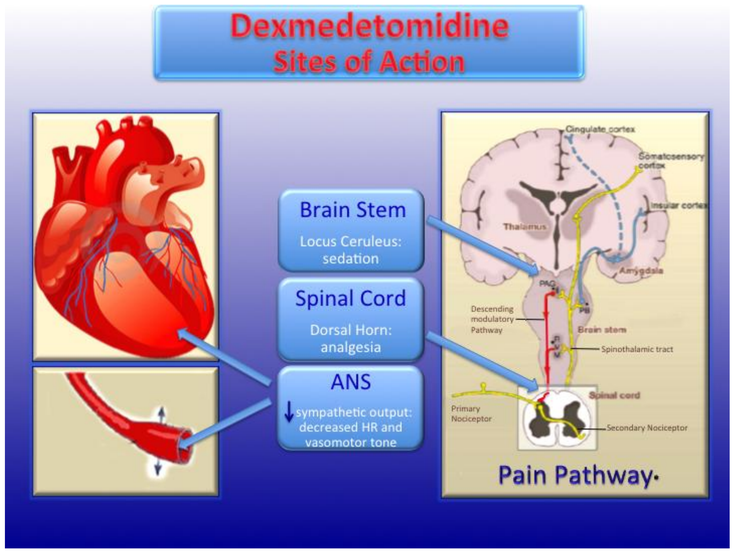

Fig 1. Sites of action of Dexmedetomidine. ANS = Autonomic Nervous System.
*Pain pathway figure adapted from Basbaum et al 2009.

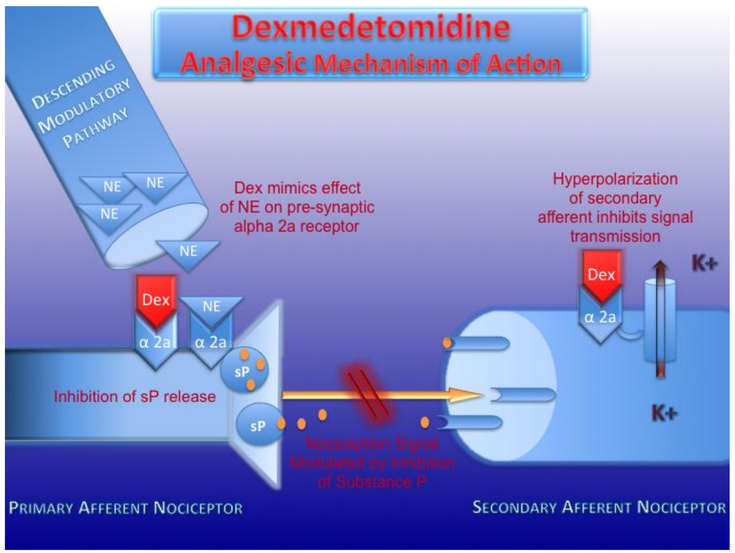

Fig 2. Central mechanism of analgesia by Dexmedetomidine (Dex) at the level of the Substantia Gelatinosa of the dorsal horn. NE = norepinephrine; sP = substance P.

Discussion

- **Dexmedetomidine** hydrochloride is 8 times more specific than clonidine for alpha-2 than alpha-1 receptors (5). The sites of action of dexmedetomidine are reviewed in figure 1.
- Analgesic mechanisms of dexmedetomidine are not fully elucidated but both **peripheral** and **central** mechanisms are implicated.
- **Peripheral** administration of dexmedetomidine can prolong analgesia from brachial plexus blocks (3), however the mechanism of analgesia remains unclear (6).
- **Central** mechanisms of analgesia involves **alpha-2 A receptors** on the primary afferent nociceptor (7,8). Presynaptic activation of the α2 receptor **inhibits** the release of **substance P**, terminating the propagation of pain signals (6,9). Postsynaptic activation of α2 receptors **hyperpolarize dorsal horn** neurons through a Gi-coupled K+ channel (7), thereby inhibiting nociception transmission to the thalamus (fig 2).
- Alpha-2 agonists act **synergistically** with opioids (8) and reduce post-op opioid consumption (1,2). One may extrapolate that dexmedetomidine worked as a co-analgesic in this patient which **modulated nociception transmission** and **enhanced the action** of **opioid agonists**, and was thus able to provide acute pain relief.
- Literature review suggests that dexmedetomidine has only been used **preemptively** for **intra-op** pain management intravenously and for regional anesthesia. Its use for acute painful exacerbations has not been previously reported.

Conclusions

- This patient's pain management represents our first APS experience with **dexmedetomidine infusions** for the management of severe post-operative acute pain.
- Further investigation is needed to explore this opioid sparing, **anti-nociceptive role** of dexmedetomidine in patients with severe injuries, acute hyperalgesia and difficult to treat acute pain.

References

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