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Title

Intrathecal and Epidural Dexmedetomidine for Obstetric Patients

Authors

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Introduction of the Problem

Opioids are a common additive to neuraxial anesthesia. Opioid related side effects, such as shivering, pruritis, nausea & vomiting, urinary retention, and respiratory depression are undesirable and potentially detrimental to patients (Armstrong & Fernando, 2016). For these reasons, opioid-free anesthesia (OFA) and opioid-sparing anesthesia (OSA) techniques have become popular to lessen opioid administration throughout the perioperative period (Bohringer et al., 2020). In the setting of neuraxial obstetric anesthesia, opioids reduce pain during delivery and provide significant analgesia post-delivery (Armstrong & Fernando, 2016). Opioid-free and opioid-sparing techniques offer satisfactory pain relief for obstetrical patients without opioid related side effects, which improves the patient experience. Additionally, the uncomfortable side effects associated with opioid use in neuraxial anesthesia negatively affect the patient (He et al., 2020). Multimodal methods have improved surgical outcomes by reducing or eliminating the use of opioids administered perioperatively (Boysen, Pappas, & Evans, 2018). Dexmedetomidine, an alpha-2 agonist, is a powerful analgesic, anxiolytic, and antiemetic. The use of dexmedetomidine lowers the need for opioids and diminishes side effects typically reported with opioid administration (Bohringer et al., 2020).

Literature Review

Dexmedetomidine has multiple benefits. Dexmedetomidine does not negatively impact cardiac, neurological, renal, and respiratory systems. When added to neuraxial anesthetics,

dexmedetomidine speeds time of sensory blockade onset, prolongs postoperative analgesia, and lowers postoperative shivering when added to neuraxial anesthetics in obstetric patients (Solanki & Goyal, 2015). The favorable side effect profile of dexmedetomidine makes it a powerful adjunct for obstetric anesthesia.

In spinal anesthesia, dexmedetomidine prolongs sensory blockade and pain relief when compared to opioid adjuncts or local anesthetics alone (Li et al., 2020; QI et al., 2016; Sun et al., 2015). Additionally, dexmedetomidine decreases the incidence of shivering in parturient patients (Nasseri et al., 2017). In epidural anesthesia, dexmedetomidine shortens the duration of labor when compared to control group labor times and augments uterine contractions compared to patients who were given opioid adjuncts. Patients who received neuraxial dexmedetomidine had superior pain relief, decreased nausea & vomiting, and pruritis compared to patients who received neuraxial opioids (Cheng et al., 2019; Jun et al., 2018).

Project Methods

The goal of this project was to review current medical literature regarding the use of dexmedetomidine as a neuraxial adjunct in obstetrical patients. This project assessed anesthesia providers' current use of neuraxial dexmedetomidine, presented the findings of a literature review, and assessed the probability of participants to change their dosing or use practices based on literature findings. An educational PowerPoint presentation was designed to provide practitioners with an in-depth understanding of dosing and administration of neuraxial dexmedetomidine in this patient population.

A convenience sample was obtained from a regional medical center in the midwestern United States. Participants included in the study included certified registered

nurse anesthetists and physician anesthesiologists employed by the hospital. The sample size was 10 participants. All participants had survey access with a QR code on their personal devices.

This project was submitted to Southern Illinois University's IRB committee for approval and was granted exemption. The project is a quality improvement project and does not include human subject experimentation. Research evaluated for this project is based on randomized studies with no identifiable patient information.

Evaluation

This project was non-experimental in design. The project was aimed at determining the participants' current use of dexmedetomidine with a pre-presentation survey and the likelihood of practice change following an educational PowerPoint presentation. Ten participants filled out the pre-presentation survey while only eight participants completed the post-presentation survey. The attrition rate was 20% due to provider availability.

Prior to the presentation, almost all anesthesia providers reported using opioids in both spinals and epidurals for obstetric patients. Eighty percent (n=8) of providers reported using fentanyl and 70% (n=7) reported using Duramorph in neuraxial anesthesia in the pre-presentation questionnaire. All but 10% (n= 1) of pre-presentation survey responders reported the use of dexmedetomidine in obstetric practice. Fifty percent (n= 5) reported dexmedetomidine use in spinal anesthesia, 20% (n= 2) in epidural anesthesia, and 10% (n= 1) use in CSE technique. Post-presentation data revealed, 62.5% (n=5) will consider the use of dexmedetomidine in spinal anesthesia, 37.5% (n= 3) will consider use in epidural anesthesia, and 12.5% (n= 1) for CSE anesthesia moving forward in their practice.

The evidence provided effectively educated participants on the advantages of incorporating dexmedetomidine into obstetric anesthesia practices. Pre-presentation, 30% (n= 3)

of the sample size reported opioid-free pain control as the greatest perceived benefit of dexmedetomidine use, while 60% (n= 6) reported a lack of opioid side effects as the greatest benefit. Thirty percent (n=3) mentioned a prolonged motor & sensory blockade as a benefit to dexmedetomidine use and only 10% (n= 1) mentioned decreased shivering.

The presentation proved successful in increasing provider knowledge of potential side effects of the medication. Post-presentation, 20% (n= 4) selected prolonged motor & sensory blockade as the greatest benefit of dexmedetomidine use and 27.5% (n= 3) selected decreased shivering. In the pre-presentation survey, 80% (n= 8) of providers reported hypotension & bradycardia as the most noticeable side effect of neuraxial dexmedetomidine; comparatively, 100% (n= 8) of participants selected hypotension & bradycardia as the most common side effects of neuraxial dexmedetomidine, demonstrating an increase in knowledge following the presentation.

The educational in-service increased provider confidence with dexmedetomidine administration. Pre-presentation, 30% (n= 3) of participants responded they were very confident in their use of dexmedetomidine, while 20% (n= 2) were extremely confident, and 30% (n= 3) reported feeling not confident. Following the presentation, 62.5% (n= 5) of providers reported feeling extremely confident, 25% (n= 2) felt very confident, and 12.5% (n= 1) felt somewhat confident; no providers reported feeling not confident with dexmedetomidine dosing after the presentation, which determined the presentation provided efficacious education to obstetric anesthesia providers.

There are several limitations to this research. The data included in this literature review was primarily gathered in Eastern countries. Parturients on average were about 2 cm shorter and a little over 20 kg lighter than parturients from the United States (Driscoll & Gregory 2020).

Higher doses of dexmedetomidine may be required to accommodate for a larger patient size, skewing this project's dosing recommendations. All studies utilized dexmedetomidine as the independent variable, while keeping local anesthetic doses constant. Using a dexmedetomidine dose with varying doses of local anesthetics may provide valuable information on how to appropriately titrate dexmedetomidine in neuraxial anesthesia based on patient height.

Impact on Practice

The evidence supporting the efficacy of dexmedetomidine as a powerful neuraxial adjunct is overwhelming. The literature search revealed dexmedetomidine can provide significant pain relief in obstetric patients presenting for spinal or epidural anesthesia. Dexmedetomidine can be administered without the untoward opioid-related side effects, and at appropriate doses, side effects due to dexmedetomidine are unlikely to occur. Neuraxial dexmedetomidine has the potential to reduce or even replace opioids in neuraxial anesthetics for parturient patients. Dexmedetomidine has significant potential for conquering the quest for effective OFA and OSA techniques.

Conclusion

The negative implications of opioid use have created a demand for opioid-free or opioid-sparing pain management (Falières, 2020). Dexmedetomidine is a unique adjunct medication providing desirable clinical benefits, such as powerful analgesia and anxiolysis, without negative side effects (Bohringer et al., 2020). These characteristics make dexmedetomidine an ideal adjunct to local anesthetics used in neuraxial analgesia and anesthesia for parturients.

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