

Effect of Intrathecal Dexmedetomidine as an Adjuvant for Labour Analgesia

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ABSTRACT

Opioids analgesics have been used commonly among several patients in labour in various studies but side effects associated with use of opioids during painless delivery are the main factors that affect rapid postpartum recovery. Opioid use can result in risk of respiratory depression in the patient and can also disrupt the baby's breathing and heart rate. So, the non opioid analgesic dexmedetomidine, a new alpha-2-adrenergic agonist came into existence, was evaluated and used intrathecally among parturients as an alternative adjuvant. The aim of the present review article was to establish the effect of non opioid analgesic dexmedetomidine, to assess the potency and the safety of dexmedetomidine when given intrathecally as an adjuvant to neuraxial block among patients in labour. Studies report that addition of dexmedetomidine improves the quality of the block, causes an early onset and better length of the sensory block, enhances the onset and duration of the motor block, as well as the onset of analgesia. Additionally, this lengthens the time needed to restore analgesia. Use of dexmedetomidine in combination with bupivacaine significantly prolongs the sensory block time in pregnant women.

Keywords: Opioids, Parturients, Sensory block, Spinal anaesthesia

INTRODUCTION

Labour pain is one of the most excruciating forms of agony a woman will ever endure. Catecholamines are released in response to maternal pain and anxiety, resulting in uncoordinated uterine contractions, diminished uteroplacental blood supply, and other complications. Although epidural anaesthesia is currently the gold standard in obstetric analgesia. Intrathecal labour analgesia, on the other hand, is a simple, straightforward, and successful technique for safe child birth without having pain. This can be utilised for intrapartum pain management in a low resource setting that is both effective and cost-efficient [1]. In the recent years, the intrathecal method of administering labour analgesia has witnessed a resurgence. Comprehensive labour pain treatment strategies aim to reduce motor blockage along with adequate analgesia and avoid labour extension. Various adjuvants are used to reduce the motor blockage caused by bupivacaine. Most commonly used drugs alone or in combination with local anaesthetics bupivacaine, ropivacaine are fentanyl, sufentanil, morphine. Though effective, it either produces insufficient analgesia with significant adverse events like- motor blockage, respiratory depression, increase in caesarean sections risk [2]. As a result, several studies have been done to assess the analgesic effect of new adjuvants in conjunction with local anaesthetics.

Recently in newer research trials [3] have found clinical evidence that (alpha 2-adrenergic agonist) dexmedetomidine also provides good analgesia and also increases analgesic property of bupivacaine without major adverse effect on maternal and neonatal outcome. Maternal satisfaction, stress, anxiety rate among parturients has also been improved with its effective analgesia property. The use of bupivacaine (intrathecally) in a low dose for labour analgesia found to be effective, it does not effect labour progression rate. The advantages of this approach include rapid onset and consistency, as well as minimal haemodynamic alterations.

Dexmedetomidine is a novel and highly selective alpha-2a receptor with sedative, anxiolytic, analgesic, antihypertensive, and sympatholytic effects. Using dexmedetomidine intrathecally causes inhibition of pain receptors, thus relieving pain of visceral organs [4]. Dexmedetomidine, when used as an additive with bupivacaine

for neuraxial block, has been shown in preclinical studies to reduce the time taken for the block onset, reduce the postoperative pain, increase block duration, decrease the further analgesic dose requirement and reduce the incidence of adverse effects [5]. Hence, the present literature review aimed to explore the effect of dexmedetomidine as a neuraxial adjuvant for labour analgesia and its effect on maternal and neonatal outcomes.

LITERATURE SEARCH

The literature search was conducted in PubMed, EMBase, Web of Science, and Google. Both international and national articles and their publications were thoroughly searched related to the use of dexmedetomidine as an adjuvant in labouring patients and were then incorporated in the present review article.

DISCUSSION

While reviewing articles and studies related to labour pain management, there are many findings related to different methods and drug combinations opted for achieving labour analgesia. A study by Fyneface-Ogan S et al., [6] on pregnant women, compared the effect of spinal analgesia using the 2.5 mg bupivacaine (hyperbaric) alone and using bupivacaine (hyperbaric) in combination with 2.5 µg dexmedetomidine and 5 µg fentanyl. It was found that when bupivacaine and dexmedetomidine was given as a single shot intrathecally there was an increased sensory block and duration of analgesia in labouring parturients. This group of parturients had lower pain scores also for longer period of time as compared to those who received bupivacaine and fentanyl or bupivacaine alone. Due to synergistic interaction with a local anaesthetic, dexmedetomidine shows its analgesic effect. It was suggested that a single intrathecal low dose dexmedetomidine shot offers a lot of promise for pain management during labour and delivery. The lack of side effects, such as drowsiness, respiratory depression, maternal hypotension, and newborn depression, with dexmedetomidine may be additional benefits for women in labour and delivery [6].

Niu XY et al., [7] also concluded that use of intrathecal 10 µg dexmedetomidine increased the duration of spinal anaesthesia and improved postoperative analgesia without increase the incidence of hypotension and other adverse events. In recent researches, spinal

mode of anaesthesia as an alternative to the epidural and combined spinal-epidural method of pain control have been recommended. Dilesh PK, et al., [8] have used 2.5 µg dexmedetomidine and 25 µg fentanyl intrathecally and epidurally by Combined Spinal Epidural (CSE) analgesia approach in labouring women for comparison in the efficacy between two drugs as an adjuvant to 2.5 mg bupivacaine. They concluded that dexmedetomidine provides a better alternative to fentanyl when added as an adjuvant to intrathecal bupivacaine, providing longer pain relief without any delay in the progress of labour in comparison to the use of fentanyl. Also, dexmedetomidine provides sustained analgesia and reduces the need for rescue epidural analgesia.

A study compared epidural blocks with or without 10 µg dexmedetomidine for labour analgesia [9]. It reported that a single subarachnoid or epidural injection of dexmedetomidine prolongs analgesia and reduces the need for rescue analgesia when compared to placebo opioids or clonidine. Dexmedetomidine has the potential to provide a better analgesic effect than placebo when used as an adjuvant to epidural local anaesthesia, have similar labour pain control to opioids, and have no obvious side-effects when compared to opioids, indicating that dexmedetomidine can safely replace opioids and be used in epidural block during labour analgesia. Areas with low resource settings single subarachnoid injection using dexmedetomidine offers good alternative over epidural block. There was another important factor other than pain reduction, that was maternal satisfaction. In this regard, Khaled GM et al., [10] performed a study on pregnant mothers, Bupivacaine 2.5 mg in combination with dexamethasone 4 mg divided into groups given along with dexmedetomidine 2.5 µg, 5 µg fentanyl, 100 µg morphine, or saline (placebo) to parturients. They found that parturients who received morphine had greater rate of side-effects like nausea, vomiting, pruritus, shivering. The incidence of maternal shivering was significantly found in fentanyl group. , when compared to fentanyl and morphine, dexmedetomidine has the highest potency for maintaining analgesia for extended periods of time without severe side effects in parturients, thus they concluded dexmedetomidine in terms of maternal satisfaction proves to be superior to opioids.

Another study also suggested that adverse effects (pruritis, motor block effect) were seen in the parturients who received intrathecal 10 µg sufentanil as an adjuvant as compared to the 10 µg dexmedetomidine [11]. As a result, they came to the conclusion that dexmedetomidine is more effective than sufentanil for achieving satisfactory labour analgesia.

Dexmedetomidine has also been used in various research studies as combined spinal epidural approach in parturients, As Gehan FE et al., [12] have reported about use of combined spinal epidural approach, parturients divided into two groups-one received only 2.5 mg bupivacaine intrathecally and the other received intrathecal dexmedetomidine 5 µg along with bupivacaine 2.5 mg. Epidural catheter was inserted in both group patients, if additional analgesia was needed. The dose requirement of epidural analgesia top-ups was found to be higher in the control group. They concluded that adding intrathecal dexmedetomidine to bupivacaine by combined spinal epidural analgesia approach, improved the quality of intraoperative analgesia and decreases the requested additional epidural doses with safer outcomes in mothers and babies. In several studies, a lower dose of dexmedetomidine 2.5 µg was employed, and the parturients remained haemodynamically stable [13,14]. Intrathecal injections of local anaesthetics are widely known for decreasing Blood Pressure (BP), but it is not seen with use of dexmedetomidine. Dexmedetomidine doses of 10 and 15 µg have also been administered intrathecally in parturients, and they have demonstrated a dose-dependent prolongation of the analgesic effects of spinal hyperbaric bupivacaine [15]. 10 µg of dexmedetomidine provided adequate analgesia for labour blockage

without significantly lowering blood pressure. The duration of labour analgesia was significantly longer in the dexmedetomidine group with the least maternal and foetal hemodynamic alterations. Dexmedetomidine, when administered within the reference dose, preserves psychomotor function and may improve mother's effort and engagement during labour. A relatively low concentration of intrathecal dexmedetomidine and bupivacaine combination have also been used [16]. The dose was chosen based on the notion of establishing an equilibrium in achieving maximum analgesia in minimal duration and preserving mother's efforts.

Adeyemi O et al., [17] also suggested use of low dose dexmedetomidine, that addition of intrathecal 5 µg dexmedetomidine to 5 µg fentanyl increased the duration of analgesia effectively when compared to intrathecal 10 µg dexmedetomidine and 10 µg fentanyl, without any adverse effect on mother or fetus. Some studies have also concluded that contractility of uterus is also increased with the use of dexmedetomidine. It increases the frequency and amplitude of uterine contraction directly. If Dexmedetomidine is used correctly during labour, it could cause hemodynamic relaxation and stability with minimal risk of respiratory depression in the pregnant mother [18]. A 5 µg dexmedetomidine could be an excellent candidate for labour analgesia as an adjuvant to local anaesthetics. During childbirth, a woman may develop an intrapartum fever, according to research, the alpha-2-adrenergic receptor is linked to thermoregulation, and dexmedetomidine reduces body temperature via the alpha-2 receptors activation, reduces the frequency of intrapartum maternal fever during labour. The central alpha-2 adrenoceptor agonist activity of dexmedetomidine, blocked the maternal thermoregulation centre. Li L et al., [16] reported the effect of dexmedetomidine on maternal temperature regulation along with pain score. Patients who received 5 µg dexmedetomidine in combination with 10 mg ropivacaine epidurally had a lower rate of intrapartum fever as compared to the control group. Thus, they concluded that dexmedetomidine could reduce the incidence of intrapartum fever and when used epidurally during labour was found to be safe for both the mother and the baby without increasing adverse events.

Sedatives and narcotics have a tendency to breach the uteroplacental barrier and can harm the unborn child, making their use in pregnant women contentious. With a maternal/fetal index of 0.77, dexmedetomidine has a good placental retention rate. Additionally, because of its high lipophilicity, it is maintained in placental tissue [19]. It does not considerably cross the placenta. However, numerous studies [20] have demonstrated that when dexmedetomidine was administered to labouring patients, the newborns had normal Apgar scores and their initial foetal heart rates did not change, demonstrating that even if there is uteroplacental transfer, it has no adverse effects on the foetal health. Dexmedetomidine should be used with caution in individuals who have volume depletion, significant left ventricular failure, or bradyarrhythmias. Dexmedetomidine dosage must be adjusted when there is renal or hepatic impairment [21].

Limitation(s)

The effects of dexmedetomidine on the mother and foetus should be investigated further in larger-scale trials. One of the study's disadvantages is that dexmedetomidine was given to all of the patients at the same dose; if the drug dose was given based on the weight of patients then it would be more accurate. In primiparous women in labour and childbirth, a greater dose of intrathecal dexmedetomidine may be required to elicit a more powerful and prolonged block. This, too, requires further more evaluation.

CONCLUSION(S)

With vigilant monitoring of hemodynamics, dexmedetomidine as a neuraxial adjuvant was clearly shown to be effective among parturients. Dexmedetomidine exhibits superior analgesic efficacy and comparable pain control to opioids during labour when

administered with spinal or epidural local anesthetics. It also reduces the need for repeated epidural dosages while maintaining good safety profiles for both parturients and the fetus. Thus, it can be concluded that dexmedetomidine is a safe, dependable, inexpensive, and acceptable technique of pain management in labouring parturients.

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