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A COMPARATIVE PROSPECTIVE STUDY OF INTRATHECAL DEXMEDETOMIDINE-FENTANYL FOR LABOR ANALGESIA

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ABSTRACT:

BACKGROUND: Particularly in developing countries, women have described the intense and frequent pain they endure during childbirth as well as the lack of options for pain management. Sedatives and parenteral opioids are the most regularly prescribed drugs for women in labor in many low-resource settings. It has been shown that his method of treating pain has very little to no effect on the discomfort experienced during birth. Relieving pain during childbirth is one of the primary goals of maternity care. It is generally established that combining spinal and epidural analgesics can reduce labor pain without endangering the mother or fetus. For extended postoperative analgesia, intrathecally administered dexmedetomidine and bupivacaine have been employed. It is an analgesic alpha 2 adrenoreceptor agonist that is very selective. It is highly lipophilic and barely crosses the placenta, according to recent evaluations.

AIM: The purpose of the study was to compare the effects of intrathecal fentanyl and dexmedetomidine on the outcomes of mothers and newborns during labor to the effects of either drug alone.

MATERIAL AND METHOD: The department of Anesthesia conducted this comparative prospective observational study. All participants gave their informed written agreement regarding their participation in the study and the use of their data for the current research project. One hundred full-term pregnant women who were admitted to the obstetric department for safe confinement were the participants. A tertiary care teaching hospital's obstetrics department's dedicated labor room served as the study's location. A multipara monitor, an ultrasound machine, an anesthetic workstation, and resuscitation supplies are all included in the labor room's setup. The benefits of labor analgesia have been discussed by the pregnant moms. The consent of an obstetrician was sought before any patient could be included in the study.

RESULTS: Out of the 120 patients who met the inclusion criteria, 110 gave their consent and were added to the study when the inclusion criteria were applied. According to the exclusion criteria, ten patients were not accepted. once the 100 patients in the predetermined sample size have been reached. The quality of the block analysis showed that Group A experienced analgesia earlier than Group B. There was statistical significance in the discrepancies. Group A also had analgesia for a longer period of time. Group A exhibits a greater degree of motor block than Group B, according to the examination of motor block. The most frequent adverse effect, according to the analysis of side effects, was pruritus, which was followed by bradycardia, hypotension, shivering, and nausea.

CONCLUSION: Intrathecal dexmedetomidine decreases the frequency of side effects and extends the duration of analgesia, in contrast to dexmedetomidine or fentanyl used alone. Intracorneal adjuvant walking epidural is a safe and effective method for labor analgesia. The duration and severity of the block are higher with intrathecal dexmedetomidine. Fentanyl increases the chance of a vaginal birth going well. Fentanyl, not dexmedetomidine, should be utilized as an intrathecal adjuvant for labor

analgesia. It provides a longer duration of analgesia with an appropriate level of labor analgesia when compared to fentanyl.

KEYWORDS: Labor, Analgesia, Dexmedetomidine, Fentanyl and Neonatal

Introduction

Labor is one of the most physically taxing experiences that women have in their lifetimes. Labor pain usually scores a minimum of 7, ranking it second or third among all painful conditions on a scale of 1 to 10.[1,2] Since the Middle Ages, physicians have been employing methods to decrease the intensity of labor pain. The modern period of labor analgesia began with the "etherization of labor" by James Young Simpson, who effectively administered the medication to a woman whose pelvis was deformed.[3] The excruciating labor pain has a number of detrimental physical and psychological impacts on the mother and fetus. Torture-induced hyperventilation and elevated catecholamine levels in the mother and fetus are the main causes of hypoxemia. With minimal risk to the mother or fetus, the commonly used technique of combined spinal epidural (CSE) analgesia lessens labor discomfort.[4] Labor pain is excruciating and leads to a spectrum of adverse physical and psychological stress to the mother and fetus.

Hyperventilation and high catecholamine levels resulting from labor pain and unpleasant uterine contractions cause hypoxemia in both the mother and the fetus.[5,6] Pain relief has two advantages: it soothes the patient and lowers the release of stress chemicals.[7] Painkillers not only make the patient feel better, but they also stop stress hormones from being released, which can exhaust the parturient's reserves and starve the fetus of oxygen and nutrients.[8]

Combining spinal epidural (CSE) analgesia with minimum adverse effects for both the mother and the fetus is a commonly recognized method of reducing labor pain.[9] Although the use of intrathecal opioids for labor analgesia is becoming more common, there is not much data to back this up. Phenyl piperidine is the source of fentanyl, a potent and fast-acting synthetic drug. Because of its short half-life, fentanyl is thought to be a great substitute for managing labor pain. During childbirth, fentanyl and bupivacaine have been used extensively to lessen motor block. Nevertheless, itching and respiratory depression are side effects of combining opioids with local anesthetics.

During childbirth, fentanyl and bupivacaine have been used extensively to lessen motor block. Nevertheless, itching and respiratory depression are side effects of combining opioids with local anesthetics.[10] Because of its inherent analgesic properties, dexmedetomidine—a highly powerful and selective alpha 2 adrenergic agonist—has been used in conjunction with spinal bupivacaine to prolong postoperative analgesia. Recent studies on the usage of dexmedetomidine during pregnancy have shown that it does not pass the placenta very much because of its high placental retention.[11] In labor, dexmedetomidine has been used intravenously and epidurally in several studies, with no negative effects on the mother or fetus.[12,13] Dexmedetomidine is a highly selective alpha-2 adrenergic agonist that has intrinsic analgesic properties and has been used intrathecally to prolong postoperative analgesia.[14,15] Since there is little placental transfer, the fetus should experience little to no change. Dexmedetomidine offers the benefit of lowering blood pressure because it controls catecholamine release. Dexmedetomidine occasionally causes bradycardia and hypotension in the mother, which could be harmful.[16] Intrathecally or intravenously administering dexmedetomidine during pregnancy is still considered off-label. Dexmedetomidine has a sympatholytic action that can lessen the stress response to surgery and an analgesic-sparing effect that considerably reduces the need for opioids.[17, 18]

MATERIAL AND METHODS

The department of Anesthesia conducted this comparative prospective observational study. All participants gave their informed written consent regarding their participation in the study and the use of their data for the current research project. One hundred full-term pregnant women who were admitted to the obstetric department for safe confinement were the participants. A tertiary care teaching hospital's obstetrics department's dedicated labor room served as the study's location. A multipara monitor, an ultrasound machine, an anesthetic workstation, and resuscitation supplies are all included in the labor room's setup. The benefits of labor analgesia have been discussed by the pregnant moms. The consent of an obstetrician was sought before any patient could be included in the study. The patient gave their written and informed consent to participate in the observational trial after being informed about the side effects of the medications being used for labor analgesia.

The inclusion criteria were as follows:

- Prebooked patients who had given consent for labor analgesia
- Age: 20–40 years
- Body mass index <35 kg.m−2
- American Society of Anesthesiology Classification Status I or II.

The exclusion criteria were as follows:

- Any condition that contraindicates the administration of central neuraxial blockade (such as coagulopathy or hypovolemic shock)
- Gestational age <36 weeks
- Obstetric complications such as preeclampsia, pregnancy-induced hypertension, gestational diabetes, or cephalopelvic disproportion
- Patients in the second stage of labor or on oxytocin infusion

STATISTICAL ANALYSIS

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 20.0 (IBM, Chicago, IL). Data are presented as mean ±SD or numbers as appropriate. Patient characteristics (age, weight, height, parity, and gestational age), onset and duration of analgesia, and pH of the umbilical artery were analyzed using the independent two-sample t-test. Other parameters were studied using the Chi-square test or Fisher's exact test as appropriate.

RESULT: -

Table 1: Mode of delivery among participants

Mode of delivery	Group A (N=50)	Group B (N=50)
Normal (n=65)	27	33
Instrumental vaginal delivery (n=8)	11	2
Cesarean delivery (n=27)	12	15

With 65 women delivering vaginally (Group A: 30; Group B: 35) and 100 patients reporting adequate analgesia (Group A: 50; Group B: 50), the overall success rate was 61.66%; however, Group B's success rate was noticeably greater. Group A had greater rates of cesarean delivery and forceps-assisted vaginal delivery.

Table 2: Quality of block among the participants

Parameter	Mean±SD	
	Group A (N=50)	Group B (N=50)
Onset time (s)	56.72±14.80	87.25±24.12
Duration of analgesia (min) (VAS score <3)	116.71±19.13	100.21±16.32
Degree of the motor block as on the Bromage Scale	3.65±0.72	4.10±0.97
Top-up required in first 6 h	5.99±1.12	9.10±2.74

The quality of the block analysis showed that Group A experienced analgesia earlier than Group B. There was statistical significance in the discrepancies. Group A also had analgesia for a longer period of time. Group A exhibits a greater degree of motor block than Group B, according to the examination of motor block.

Table 3: Incidence of maternal and fetal side effects in both the groups

Parameter	Mean±SD	
	Group A (N=50)	Group B (N=50)
Pruritus	1	23
Hypotension	6	5
Bradycardia	4	3
Nausea	3	5
Vomiting	1	3

The investigation of adverse effects revealed that pruritus was the most common side effect (albeit it was only observed in Group B). It was followed by hypotension, bradycardia, shivering, and nausea. Fetal ultrasound and Doppler examination revealed no abnormalities in the umbilical artery or uterine blood flow. Group A experienced reduced variability in heart rate due to a lower pulsatility index. The analysis of fetal data demonstrated the safety of both treatments, and after six weeks of life, all neonates in both groups were found to be well and safe.

DISCUSSION

There have long been controversies and myths around labor pain treatment. As such, the challenge of delivering safe and effective analgesia during labor has persisted. Labor analgesia has evolved over time to minimize motor obstruction, permit walking epidurals, and stop labor from going into overdrive. Lipophilic opioids, such as fentanyl, have been routinely used intrathecally and epidurally for labor analgesia in addition to local anesthetics. A selective alpha 2 adrenoreceptor agonist, dexmedetomidine has been applied as an adjuvant in spinal and epidural anesthetic procedures. Compared to local anesthetics alone, it has several advantages, such as a longer duration of analgesia and no adverse neurological consequences.[19,20] However, the degree of the block must be balanced during labor analgesia to avoid any motor block, which is necessary for a good vaginal delivery. Adjuvants are increasingly being used in labor spinal analgesia, as they have long been used in clinical practice for spinal anesthesia.[17]

Ezz Gehan et al.2017[21] used 20 µg dexmedetomidine intrathecally, which formed the basis of the dexmedetomidine dose in this study. Dexmedetomidine does not pass the placenta very much and has a high placental retention (0.77 maternal/fetal index). Similar to fentanyl, it has a high lipophilicity and is hence stored in placental tissue. Research indicates that dexmedetomidine has a high placental retention rate and directly and dose-dependently increases the frequency and amplitude of uterine contractions, which may make it advantageous to use as an adjuvant analgesic during labor.

Research findings indicate that dexmedetomidine has a high degree of placental retention and directly and dose-dependently increases the frequency and amplitude of uterine contractions, indicating potential benefits for usage as an adjuvant analgesic during labor. Therefore, excellent analgesia and the absence of motor block were anticipated upon intrathecal dexmedetomidine injection, indicating that this medication is appropriate for labor analgesia. Its intrathecal usage in labor, however, is still not approved for use. This study's 10 µg dose was lower than intravenous doses utilized in the past during pregnancy, and no negative effects on the unborn child were predicted. Dexmedetomidine inhibits nociceptive neurons triggered by peripheral A and C fibers via binding to receptors in the substantia gelatinosa of the spinal cord's dorsal horn. Moreover, it prevents

substance P, a nociceptive neurotransmitter, from being released.[22]

Al-Mustafa et al 2009[23] observed dose-dependent prolongation of the duration of action of analgesia with reduced analgesic requirement when intrathecal dexmedetomidine dosages increased (5, 10, and 15 μg).

Consequently, it is proposed that intrathecal dexmedetomidine and fentanyl, with their longer duration of analgesia and lack of adverse effects (like sedation, respiratory depression, mother hypotension, and neonatal depression), could be a desirable substitute for labor analgesia. The results of this study will be crucial in low-resource nations where the tools, supplies, and expertise required to provide an epidural analgesic service are lacking. Given the lengthy duration of analgesia it demonstrated in our trial, intrathecal bupivacaine/dexmedetomidine may be the only medicine administered as a single shot to multiparous women in labor. Because dexmedetomidine has no adverse effects, such as drowsiness, respiratory depression, maternal hypotension, or newborn depression, it may offer extra advantages to women undergoing labor and delivery. Even though this study adds to our knowledge of dexmedetomidine, further investigation might be necessary to completely comprehend how this medication relieves labor pain. Nonetheless, this experiment showed that a single intrathecal injection of low-dose dexmedetomidine had a substantial potential to lessen labor and delivery discomfort. To obtain a more effective and prolonged block during labor and delivery in primiparous women, a higher intrathecal DMT dose would be necessary.[9,24]

CONCLUSION:

Intrathecal dexmedetomidine decreases the frequency of side effects and extends the duration of analgesia, in contrast to dexmedetomidine or fentanyl used alone. Intracerecal adjuvant walking epidural is a safe and effective method for labor analgesia. The duration and severity of the block are higher with intrathecal dexmedetomidine. Fentanyl increases the chance of a vaginal birth going well. Fentanyl, not dexmedetomidine, should be utilized as an intrathecal adjuvant for labor analgesia. It provides a longer duration of analgesia with an appropriate level of labor analgesia when compared to fentanyl. It does not harm the mother or the baby while maintaining hemodynamic stability.

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