Does meperidine analgesia affect the incidence of obstetric lacerations at vaginal delivery?

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ABSTRACT

Purpose: To study whether meperidine analgesia affects the incidence of obstetric lacerations at normal vaginal deliveries.

Materials and methods: A retrospective cohort study of all women with term vertex singleton pregnancies, who underwent normal vaginal deliveries, in a single tertiary hospital, between 2011 and 2015, was performed. The incidence of various obstetric lacerations was compared between deliveries with meperidine analgesia and deliveries with no analgesia. Deliveries with epidural analgesia and instrumental deliveries were excluded. An intravenous infusion of 75 mg of meperidine was administered together with 25 mg of promethazine. A multivariate logistic regression analysis was performed to assess the association between meperidine analgesia and obstetric lacerations, after controlling for confounders.

Results: Overall, 5227 (91.8%) deliveries with no analgesia and 466 (8.1%) deliveries with meperidine analgesia were included. Meperidine analgesia was associated with a decreased risk of first- and second-degree perineal lacerations (adjusted OR = 0.63, 95% CI = 0.49–0.81), and a decreased risk of any suturing (adjusted OR = 0.73, 95% CI = 0.59–0.91), after controlling for confounders. Meperidine analgesia did not affect the risk of severe perineal lacerations or episiotomies.

Conclusion: Meperidine analgesia may have a protective effect against first- and second-degree perineal lacerations.

Introduction

Systemic opioids have long been used for labor analgesia [1]. However, the use of these agents has become less popular due to maternal and fetal adverse effects, as well as lower efficacy compared with neuroaxial analgesia [2,3]. Yet, it is still used in many obstetric units [4,5], and may serve as an alternative to epidural analgesia when it is not feasible or contraindicated. Meperidine (pethidine, demerol) is the opioid most widely used for labor analgesia because of its familiarity and low cost [6].

Birth canal lacerations complicate up to 79% of all vaginal deliveries [7,8]. They may involve the cervix, vagina, labia, periurethral area, perineum and anal sphincter complex [9]. Obstetric lacerations may result in short-term and long-term morbidity, such as pain, discomfort and sexual dysfunction, and may lead to major physical, psychological and social problems [10,11]. Hence, primary prevention is important. Several factors were consistently shown to be associated with obstetric lacerations, such as nulliparity, high birthweight, occiput posterior position and operative vaginal delivery [12–14].

There is solid evidence regarding the impact of epidural analgesia on the incidence of obstetric lacerations [15]. However, studies evaluating the impact of meperidine analgesia on obstetric lacerations are lacking. Therefore, we aimed to study the impact of meperidine analgesia on the incidence of obstetric lacerations at normal vaginal deliveries.

Materials and methods

A retrospective cohort study of all women with term vertex singleton pregnancies, undergoing normal vaginal delivery, in a single tertiary university-affiliated
medical center, between January 2011 and October 2015, was performed. Exclusion criteria were operative vaginal deliveries, deliveries with epidural analgesia, stillbirth, multiple pregnancies and preterm deliveries (<37 weeks of gestation). The study was approved by the local Institutional Review Board (Registry No. WOMC-0195–16).

Labor ward management protocol

Women desiring pain relief during labor are routinely offered epidural analgesia. If it is contraindicated or undesired, they are offered opioid-based analgesia. A single dose of 75 mg of meperidine is administered together with 25 mg of promethazine intravenously as a continuous infusion over 30 min.

In our department, normal vaginal deliveries are managed by midwives. Manual perineal support (“hands on” technique), as previously described by Laine et al. [16] is performed in all deliveries. This technique was shown to significantly decrease the incidence of severe perineal lacerations and was later reaffirmed in a larger cohort study [17]. Briefly, it consists of slowing the delivery of the infant’s head during the final part of the second stage of delivery (crowning) by keeping a hand on the neonate’s head and instructing the mother not to push. In addition, the other hand is used for perineal support and for guiding the head through the introitus.

It is common practice in our department to prefer delayed pushing. Perineal massage is almost always performed during pushing. We do not use warm compresses. With very few exceptions, women give birth in the supine position. Additionally, we follow a policy of restrictive use of mediolateral episiotomy, which is performed based on the clinical judgment of the attending midwife.

Study design

Maternal and delivery characteristics were collected from the labor ward-computerized data system. These data included maternal age, parity, body mass index (BMI), labor analgesia, premature rupture of membranes (PROM), induction of labor, diabetes mellitus (gestational or pre-gestational), trial of labor after cesarean delivery (TOLAC) attempts, gestational age at delivery, birthweight, second-stage duration and the presence of obstetric lacerations. Prolonged second stage was defined as more than 1 h in multiparous women, or 2 h in nulliparous women. To minimize the bias using administrative data, we manually checked and validated the data at the time of database enrollment.

The degree of perineal lacerations in each delivery was defined and lacerations were repaired by the attending obstetrician. We use the classification system recommended by the American College of Obstetricians and Gynecologists (ACOG) [9]. Briefly, first-degree perineal lacerations involve only the perineal skin, second-degree perineal lacerations involve the perineal muscle but not the anal sphincter, third-degree perineal lacerations involve the anal sphincter complex and fourth-degree perineal lacerations involve the anal sphincter complex and the anal epithelium. Severe perineal lacerations (third and fourth degree) were repaired by a skilled obstetrician experienced in the repair of obstetric anal sphincter injuries (OASIS).

For the purpose of the study, a comparison was performed between deliveries in which no analgesia was administered and deliveries in which meperidine analgesia was administered. The primary outcome was the need for any suturing (including spontaneous lacerations and episiotomies). The secondary outcomes included the rates of minor perineal trauma (first and second-degree perineal lacerations), severe perineal lacerations (third and fourth degree), vaginal lacerations, anterior wall lacerations (periclitorial, periurethral and labial lacerations), cervical lacerations and episiotomies. Only lacerations that needed repair were documented.

Statistics

Statistical analysis was performed using SPSS software version 23 (IBM Inc., Chicago, IL). Continuous variables were compared by Student’s t-test and nominal variables were compared by the Chi-squared test. A multivariate logistic regression analysis was performed to assess the association between meperidine analgesia and the incidence of perineal lacerations, after controlling for the following confounders: maternal age, gestational age, nulliparity, birthweight, PROM, induction of labor and prolonged second stage. All tests were considered significant at p < 0.05.

Results

During the study period, a total of 24,056 deliveries were conducted in our department, out of which 5693 met the inclusion criteria (Figure 1). In 5227 (91.8%) deliveries, no analgesia was administered, and in 466 (8.1%) deliveries meperidine analgesia was administered.
Table 1 presents the baseline characteristics of the study groups. As expected, women who did not receive analgesia during labor were older and more frequently multiparous. There were higher rates of PROM and induction of labor in women who received meperidine analgesia. The study groups did not differ with regard to maternal BMI, gestational age, birthweight, the rate of macrosomia (birthweight >4000 g), TOLAC, diabetes mellitus or prolonged second stage of labor.

Overall, 2478 (43.5%) patients sustained any obstetric laceration including episiotomies. The incidence of severe perineal lacerations (OASIS) was 0.3%. Table 2 presents the rate of the various obstetric lacerations by study group. Crude odds ratios (ORs) and adjusted ORs are presented along with 95% confidence intervals (CIs). On multivariate logistic regression analysis, meperidine analgesia had a protective effect with regard to minor perineal lacerations (adjusted OR = 0.63, 95% CI = 0.49–0.81), and overall need for suturing (adjusted OR = 0.73, 95% CI = 0.59–0.91), after controlling for maternal age, gestational age, nulliparity, birthweight, PROM, induction of labor and prolonged second stage of labor. Although occurring more frequently in women receiving meperidine, anterior vaginal wall lacerations and episiotomies were not associated with meperidine analgesia after controlling for confounding factors.
The study groups did not defer with regard to the incidence of OASIS.

**Discussion**

In the present study, we found that meperidine analgesia during labor had a protective effect with regard to obstetric lacerations. Meperidine was associated with a 37% decrease in the rate of minor perineal lacerations and a 27% decrease in the rate of any suturing.

Obstetric lacerations are prevalent and may be associated with significant pain and psychological distress at the time of suturing [18]. The majority of women experience some short-term discomfort or pain following perineal lacerations repair, and up to 20% of women will continue to have long-term problems, such as superficial dyspareunia. Short- and long-term maternal morbidity may also lead to major physical, psychological and social problems, affecting the woman’s ability to care for her new baby [11].

Recently, the use of opioid-based analgesia has become less popular due to maternal and fetal adverse effects [6]. Moreover, it has been shown to be less effective for pain relief compared to epidural analgesia [19]. Meperidine effects on maternal mental status have been studied extensively and its side effects include sedation, impaired ability to make decisions and altered mobility [1]. Nevertheless, despite its limitations, meperidine is still used in many obstetric units [4,5] and may be an alternative to epidural analgesia when it is not feasible or contraindicated.

Surprisingly, evidence regarding the impact of meperidine analgesia on obstetric lacerations is scarce. Jander et al. [20] found that labor analgesia, excluding epidural analgesia and nitrous oxide, was associated with severe perineal lacerations. However, this study included only 47 deliveries with meperidine analgesia. Moreover, meperidine analgesia was evaluated together with other types of analgesia such as acupuncture and pudendal nerve block, and not as a single factor. Another retrospective study [21] assessed delivery outcomes in 1835 women who received different types of labor analgesia, out of which 285 received meperidine. Meperidine administration did not affect the incidence of overall obstetric lacerations. However, the authors did not evaluate the specific impact of meperidine on the different types of lacerations.

In our study, we found that meperidine analgesia was associated with a decreased risk of first- and second-degree perineal lacerations as well as any need for suturing. It did not affect the risk of severe perineal lacerations. Several reasons may explain our results; the pain relief after receiving meperidine analgesia may improve the communication between the parturient women and the midwife, enabling the latter to control the rate of the fetal head extension during crowning. That maneuver was previously shown to reduce the incidence of perineal tears [22]. Furthermore, meperidine analgesic effect may help achieving relaxation of the pelvic muscles [2].

To the best of our knowledge, this is the first study examining the effect of meperidine analgesia on the incidence of the various obstetric lacerations. It includes a large cohort of deliveries in a single tertiary medical center. Several limitations, however, must be acknowledged. First, its retrospective design makes it difficult to identify all potential confounders. The study groups differed with regard to maternal age, and the rates of nulliparity, PROM and induction of labor. In order to control for these differences, we used a multivariate logistic regression analysis. Second, although it is a known risk factor for severe perineal tears, the occurrence of persistent occiput posterior position was not compared between the study groups, because it is not routinely documented in our department. Third, due to the low incidence of severe perineal lacerations, our study was not sufficiently powered to detect a difference in the rate of these lacerations. This may be partly explained by the exclusion of operative vaginal deliveries. Therefore, larger studies are needed to evaluate the impact of meperidine on severe perineal lacerations.

In conclusion, meperidine analgesia during labor has a protective effect against obstetric lacerations. Its use may be beneficial for women at high risk for obstetric lacerations in whom epidural analgesia is not feasible. Further research is needed to evaluate the impact of meperidine analgesia on severe perineal lacerations.

**Disclosure statement**

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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