Volume 74, No. 5
May 1991

THE JOURNAL OF Anesthesiology
THE AMERICAN SOCIETY OF ANESTHESIOLOGISTS, INC.

EDITORIAL VIEWS

Anesthesiology
74:805–808, 1991

Epidural Anesthesia and Instrumental Vaginal Delivery

Epidural anesthesia during labor is associated with an increased risk of instrumental vaginal delivery. But there remains controversy as to whether there is a causal relationship between epidural anesthesia and the incidence of instrumental delivery. Retrospective studies suffer from the problem of selection bias: that is, women at increased risk for operative delivery are more likely to request and receive epidural anesthesia during labor than are women with rapid, uncomplicated labor. In some cases it is difficult to distinguish between epidural anesthesia administered for pain relief during labor from anesthesia administered specifically for instrumental delivery.[1] Further, both retrospective and prospective studies suffer from the difficulty of distinguishing *indicated* instrumental deliveries from *elective* instrumental deliveries. An obstetrician is more likely to perform an elective instrumental delivery in a patient with effective anesthesia than in a patient without anesthesia.

Why should anesthesiologists be concerned with this controversy? A properly performed outlet or low forceps delivery is not associated with adverse neonatal outcome.[2–5] However, the neonatal risk of midpelvis instrumental delivery remains controversial.[3–6] Regardless of neonatal risk, instrumental delivery is associated with an increased risk of maternal trauma (*e.g.*, third- and fourth-degree vaginal lacerations, which are associated with a small but not negligible risk of rectovaginal fistula). Regardless of the magnitude of these risks, many patients want to minimize the risk of operative intervention, and they *perceive* that an increased risk of instrumental vaginal delivery is undesirable.

In only two published studies have parturients been randomized to receive either epidural anesthesia or systemic opioid analgesia during the first stage of labor.[7,8] In the first study,[7] there was a significantly increased incidence of instrumental delivery among patients who received epidural bupivacaine (0.5%) compared to that among patients who received intramuscular meperidine. Unfortunately, randomization occurred *before* the final consent was obtained. As a result, the two groups of patients were not at similar risk for instrumental delivery. For example, the epidural group included a significantly greater number of women undergoing induction of labor, a risk factor for prolonged labor and operative delivery. In the second study,[8] patients were randomized to receive either epidural bupivacaine (0.375%) or intramuscular meperidine during the first stage of labor. There was no difference between the two groups in the incidence of instrumental delivery, but the authors gave no additional bupivacaine after 8-cm cervical dilation. Thus, neither group consistently had satisfactory analgesia during the second stage, and 85% of patients in each group required pudendal block at delivery.

Given the widespread use of epidural anesthesia in clinical practice, it is difficult to randomize patients to receive either epidural anesthesia or an alternate—and often less effective—analgesic technique. For this reason, there is interest in determining how variations in epidural technique might alter the incidence of instrumental delivery. For example, does maintenance of anesthesia during the second stage affect the incidence of instrumental delivery? In a randomized but nonblinded study, Phillips and Thomas[9] reported no increase in the incidence of instrumental delivery in nulliparous women who received additional epidural bupivacaine (0.25%) at complete cer-

Accepted for publication January 24, 1991.
Reprints will not be available.
Address correspondence to Dr. Chestnut: Department of Anesthesia, The University of Iowa Hospitals and Clinics, Iowa City, Iowa 52242.
Key words: Anesthesia: obstetrics. Anesthetic techniques: epidural.

vical dilation, compared with the incidence in women who received no additional bupivacaine. However, it is unclear as to how the two groups actually differed from one another in management, since there was no significant difference between groups either in total dose of bupivacaine (72 ± 38 and 63 ± 35 mg, respectively) or in number of doses of bupivacaine (4 ± 2 doses per patient in each group).

We have performed three randomized, double-blind studies[10–12] in which nulliparous women receiving continuous epidural infusion of local anesthetic were randomized to receive either additional local anesthetic or saline placebo during the second stage. In the first study,[10] maintenance of an epidural infusion of 0.75% lidocaine beyond a cervical dilation of 8 cm neither prolonged the second stage of labor nor increased the incidence of instrumental delivery, but it also did not reliably provide second-stage analgesia. That is, women who continued to receive lidocaine did not have analgesia that was clearly superior to the analgesia experienced by women who received saline placebo. In the second study,[11] maintenance of an epidural infusion of 0.125% bupivacaine beyond a cervical dilation of 8 cm resulted in profound second-stage analgesia that was clearly superior to that experienced by those women whose bupivacaine was replaced by saline placebo. However, maintenance of the epidural bupivacaine infusion significantly prolonged the second stage of labor and nearly doubled the incidence of instrumental vaginal delivery (52% *vs.* 27%, $P < 0.05$). In the third study,[12] maintenance of an epidural infusion of 0.0625% bupivacaine–0.0002% fentanyl beyond full cervical dilation neither prolonged the second stage nor increased the risk of instrumental vaginal delivery, but it provided second-stage analgesia only marginally better than that experienced by women who received saline placebo. Collectively, these three studies[10–12] illustrate two fundamental principles of obstetric anesthesia. First, epidural anesthesia during labor is not a generic procedure. Second, epidural administration of local anesthetic (with or without opioid) during the second stage is not synonymous with provision of effective analgesia.

A decade ago, anesthesiologists welcomed the introduction of epidural and intrathecal opioid administration into obstetric anesthesia practice. This technique promised effective analgesia without sympathectomy, motor block, or alteration of the patient's voluntary expulsive efforts. Unfortunately, epidural administration of an opioid alone does not consistently provide satisfactory analgesia during labor, especially during the second stage. But several groups have observed that epidural administration of a solution containing *both* local anesthetic and opioid provides excellent analgesia.[13–22] Further, the addition of opioid to a solution of local anesthetic reduces the total dose of local anesthetic needed and results in less intense motor block.[13,14,16–22] Unfortunately, previously published studies have not confirmed that the addition of opioid to the solution of local anesthetic reduces the incidence of instrumental delivery. For example, we[17] observed that the continuous epidural infusion of 0.0625% bupivacaine–0.0002% fentanyl provided analgesia similar to that provided by the continuous epidural infusion of 0.125% bupivacaine alone. Women in the bupivacaine–fentanyl group experienced less intense motor block, but they did not have a significantly shorter second stage or a higher incidence of spontaneous delivery. However, the epidural infusion was discontinued at full cervical dilation in both groups. By allowing the block to wear off in both groups, it is possible that we lost the opportunity to detect a difference between groups in method of delivery.

In this issue of ANESTHESIOLOGY, Vertommen *et al.*[23] report the results of a multicenter randomized study of epidural bolus administration of bupivacaine (0.125%) with epinephrine (1:800,000), with and without sufentanil, in 695 parturients of mixed parity. This study commands our attention for at least two reasons. First, it is the largest published randomized trial of two epidural anesthetic techniques, with and without opioid, during labor. Second, the authors observed a decreased incidence of instrumental delivery in the group that received sufentanil (24 *vs.* 36%, $P < 0.01$). The authors attributed this reduction to the decreased total dose of bupivacaine (34 ± 17 *vs.* 42 ± 19 mg, $P < 0.001$) and the decreased intensity of motor blockade in the sufentanil group. At the same time, they observed no adverse effect of epidural sufentanil on the neonates.

Multicenter randomized studies are regrettably rare in obstetric anesthesia, and I commend the authors for successfully performing this study. Unfortunately, for several reasons it does not settle the issue of whether anesthesiologists should add opioid to epidural local anesthetic during labor.

First, the study design was least stringent with regard to the indications for instrumental delivery. The authors did not prohibit elective instrumental deliveries, and they did not distinguish between *elective* and *indicated* instrumental deliveries. Indeed, the authors acknowledged that obstetricians in Belgium (where the study was performed) typically terminate the second stage at 1 h. In contrast, the American College of Obstetricians and Gynecologists* has defined a prolonged second stage as greater than 3 h in nulliparous women and greater than 2 h in parous women with epidural anesthesia. Had the obstetricians in this study allowed the second stage to progress beyond 1

* The American College of Obstetricians and Gynecologists Committee on Obstetrics: Maternal and Fetal Medicine: Obstetric forceps. Number 71, 1989

h, it is possible that there would have been no difference between groups in the incidence of instrumental delivery.

Second, patient expectations, perception of labor pain, and epidural anesthetic requirements vary among patient populations[24] and may differ between Belgian women and women in other countries, such as the United States. Even if patients in the current study considered their analgesia to be adequate, a United States anesthesiologist might ask: "Would such small total doses of bupivacaine, with or without sufentanil and epinephrine, consistently provide effective first- and second-stage analgesia in my patients?"

The third and perhaps most important limitation to this study is that the authors did not specifically evaluate and report the quality of analgesia during the second stage or the quality of perineal anesthesia at delivery. The authors only stated that "no difference was found in the quality of analgesia during the second stage of labor or during episiotomy and suturing." But *what* was the quality of analgesia *during the second stage*? For example, what were the visual analog pain scores during the second stage? How did patients in each group rate their analgesia during the second stage? How many patients in each group required supplemental anesthesia at delivery? Indeed, it is possible that neither group had effective second-stage analgesia.

The current study does not change the following: to date, no published study has shown that one can consistently provide effective analgesia *throughout the second stage of labor* without increasing the risk of instrumental delivery. For this reason anesthesiologists face a dilemma. We recognize and appropriately argue against the double standard that exists in modern medicine. (Only in obstetrics is it considered "acceptable" for patients to experience severe pain while under a physician's care.) On the other hand, provision of anesthesia in the operating room typically *helps* the surgeon fulfill his or her goals (successful performance of surgery). In contrast, provision of effective intrapartum anesthesia in some cases might stand in the way of the parturient's and obstetrician's goal (*i.e.*, spontaneous vaginal delivery).

It therefore seems appropriate for the anesthesiologist to try to provide substantial (albeit not always total) analgesia during both the first and second stage without interfering with the progress of labor. We continue to await documentation of the ideal method of balancing those objectives.

Meanwhile, should the anesthesiologist add opioid to the epidural local anesthetic during labor? In my judgment, it seems reasonable to add opioid primarily if the goal is to reduce the dose of local anesthetic. (That is, it seems unnecessary to add opioid to a concentration of local anesthetic that is analgesic by itself.) Regardless of whether or not the addition of opioid to local anesthetic reduces the incidence of instrumental delivery, the decreased motor block represents a tangible benefit to the mother. Also, the use of a more dilute solution of local anesthetic may decrease the extent of sympathectomy and risk of hypotension, and it may decrease the risk of adverse outcome associated with unintentional intravenous or intrathecal injection. Epidural administration of a lipid-soluble opioid (*e.g.*, fentanyl, sufentanil, or meperidine) reduces the incidence of shivering,[25–28] and it seems to produce an improved sense of well-being, independent of the analgesia achieved.[15] Pruritus occurs frequently but rarely is bothersome, except with a hydrophilic agent such as morphine.

Other questions, however, remain unanswered. For example, does epidural administration of opioid delay maternal gastric emptying and increase the risk of aspiration during subsequent general anesthesia?[29] Does epidural administration of opioid increase the risk of cesarean section during the first stage of labor? Lysak *et al.*[30] observed that 12 of 38 women who received epidural bupivacaine with fentanyl underwent cesarean section, as compared to only 2 of 34 women who received bupivacaine alone. In the current study by Vertommen *et al.*,[23] there was a nonsignificant difference (5.7 *vs.* 4.0%) in the incidence of cesarean section between the two groups. In contrast, Naulty *et al.*[31] retrospectively observed that epidural administration of 0.125–0.25% bupivacaine with 0.0002% fentanyl was associated with fewer cesarean sections than was epidural administration of 1.5% lidocaine or 0.25–0.5% bupivacaine alone.

Although most published studies suggest that epidural administration of opioid is safe for the infant,[13,14,16–22,30,32,33] questions remain. For example, should one limit the total dose of opioid? (In the current study, Vertommen *et al.*[23] limited the total dose of sufentanil to ≤ 30 μg). Should there be a minimum interval between the last injection of opioid and delivery? (Vertommen *et al.* did not maintain an infusion of sufentanil until delivery, and they did not identify the interval between the last bolus injection of sufentanil and delivery.) Finally, just as there is a small but tangible risk of severe maternal respiratory depression after epidural administration of opioid,[34,†] is it possible that epidural opioid administration causes infrequent but significant neonatal depression? Clearly, as yet there is no study sufficiently large to answer this question.

DAVID H. CHESTNUT, M.D.
Departments of Anesthesia and Obstetrics and Gynecology
University of Iowa College of Medicine
Iowa City, Iowa

† Leicht CH, Hughes SC, Dailey PA, Shnider SM, Rosen MA: Epidural morphine sulfate for analgesia after cesarean section: A prospective report of 1,000 patients (abstract). ANESTHESIOLOGY 65:A366, 1986

References

1. Flamm BL, Newman LA, Thomas SJ, Fallon D, Yoshida MM: Vaginal birth after cesarean delivery: Results of a 5-year multicenter collaborative study. Obstet Gynecol 76:750–754, 1990
2. Livnat EJ, Fejgin M, Scommegna A, Bieniarz J, Burd L: Neonatal acid–base balance in spontaneous and instrumental vaginal deliveries. Obstet Gynecol 52:549–551, 1978
3. McBride WG, Black BP, Brown CJ, Dolby RM, Murray AD, Thomas DB: Method of delivery and developmental outcome at five years of age. Med J Aust 1:301–304, 1979
4. Friedman EA, Sachtleben-Murray MR, Dahrouge D, Neff RK: Long-term effects of labor and delivery on offspring: A matched-pair analysis. Am J Obstet Gynecol 150:941–945, 1984
5. Gilstrap LC, Hauth JC, Schiano S, Connor KD: Neonatal acidosis and method of delivery. Obstet Gynecol 63:681–685, 1984
6. Dierker LJ, Rosen MG, Thompson K, Lynn P: Midforceps deliveries: Long-term outcome of infants. Am J Obstet Gynecol 154: 764–768, 1986
7. Robinson JO, Rosen M, Evans JM, Revill SI, David H, Rees GAD: Maternal opinion about analgesia for labour: A controlled trial between epidural block and intramuscular pethidine combined with inhalation. Anaesthesia 35:1173–1181, 1980
8. Philipsen T, Jensen NH: Epidural block or parenteral pethidine as analgesic in labour: A randomized study concerning progress in labour and instrumental deliveries. Eur J Obstet Gynecol Reprod Biol 30:27–33, 1989
9. Phillips KC, Thomas TA: Second stage of labour with or without extradural analgesia. Anaesthesia 38:972–976, 1983
10. Chestnut DH, Bates JN, Choi WW: Continuous infusion epidural analgesia with lidocaine: Efficacy and influence during the second stage of labor. Obstet Gynecol 69:323–327, 1987
11. Chestnut DH, Vandewalker GE, Owen CL, Bates JN, Choi WW: The influence of continuous epidural bupivacaine analgesia on the second stage of labor and method of delivery in nulliparous women. ANESTHESIOLOGY 66:774–780, 1987
12. Chestnut DH, Laszewski LJ, Pollack KL, Bates JN, Manago NK, Choi WW: Continuous epidural infusion of 0.0625% bupivacaine-0.0002% fentanyl during the second stage of labor. ANESTHESIOLOGY 72:613–618, 1990
13. Van Steenberge A, Debroux HC, Noorduin H: Extradural bupivacaine with sufentanil for vaginal delivery: A double-blind trial. Br J Anaesth 59:1518–1522, 1987
14. Phillips GH: Combined epidural sufentanil and bupivacaine for labor analgesia. Reg Anesth 12:165–168, 1987
15. Brownridge P, Obst D: Epidural bupivacaine–pethidine mixture: Clinical experience using a low-dose combination in labour. Aust NZ J Obstet Gynaecol 28:17–24, 1988
16. Celleno D, Capogna G: Epidural fentanyl plus bupivacaine 0.125 per cent for labour: Analgesic effects. Can J Anaesth 35:375–378, 1988
17. Chestnut DH, Owen CL, Bates JN, Ostman LG, Choi WW, Geiger MW: Continuous infusion epidural analgesia during labor: A randomized, double-blind comparison of 0.0625% bupivacaine/0.0002% fentanyl *versus* 0.125% bupivacaine. ANESTHESIOLOGY 68:754–759, 1988
18. Phillips G: Continuous infusion epidural analgesia in labor: The effect of adding sufentanil to 0.125% bupivacaine. Anesth Analg 67:462–465, 1988
19. Reynolds F, O'Sullivan G: Epidural fentanyl and perineal pain in labour. Anaesthesia 44:341–344, 1989
20. Hunt CO, Naulty JS, Malinow AM, Datta S, Ostheimer GW: Epidural butorphanol–bupivacaine for analgesia during labor and delivery. Anesth Analg 68:323–327, 1989
21. Jones G, Paul DL, Elton RA, McClure JH: Comparison of bupivacaine and bupivacaine with fentanyl in continuous extradural analgesia during labour. Br J Anaesth 63:254–259, 1989
22. Rodriguez J, Payne M, Afrasiabi A, Abboud TK, Zhu J, Reyes A, Steffens Z: Continuous infusion epidural anesthesia during labor: A randomized, double-blind comparison of 0.0625% bupivacaine/0.002% butorphanol and 0.125% bupivacaine. Reg Anesth 15:300–303, 1990
23. Vertommen JD, Vandermeulen E, Van Aken H, Vaes L, Soetens M, Van Steenberge A, Mourisse P, Willaert J, Noorduin H, Devlieger H, Van Assche AF: The effects of the addition of sufentanil to 0.125% bupivacaine on the quality of analgesia during labor and on the incidence of instrumental deliveries. ANESTHESIOLOGY 74:809–814, 1991
24. Senden IPM, vd Wetering MD, Eskes TKAB, Bierkens PB, Laube DW, Pitkin RM: Labor pain: A comparison of parturients in a Dutch and an American teaching hospital. Obstet Gynecol 71: 541–543, 1988
25. Brownridge P: Shivering related to epidural blockade with bupivacaine in labour, and the influence of epidural pethidine. Anaesth Intensive Care 14:412–417, 1986
26. Matthews NC, Corser G: Epidural fentanyl for shaking in obstetrics. Anaesthesia 43:783–785, 1988
27. Johnson MD, Sevarino FB, Lema MJ: Cessation of shivering and hypothermia associated with epidural sufentanil. Anesth Analg 68:70–71, 1989
28. Sevarino FB, Johnson MD, Lema MJ, Datta S, Ostheimer GW, Naulty JS: The effect of epidural sufentanil on shivering and body temperature in the parturient. Anesth Analg 68:530–533, 1989
29. Thorén T, Tanghöj H, Wattwil M, Järnerot G: Epidural morphine delays gastric emptying and small intestinal transit in volunteers. Acta Anaesthesiol Scand 33:174–180, 1989
30. Lysak SZ, Eisenach JC, Dobson CE: Patient-controlled epidural analgesia during labor: A comparison of three solutions with a continuous infusion control. ANESTHESIOLOGY 72:44–49, 1990
31. Naulty JS, Smith R, Ross R: Effect of changes in labor analgesic practice on labor outcome (abstract). ANESTHESIOLOGY 69: A660, 1988
32. Cohen SE, Tan S, Albright GA, Halpern J: Epidural fentanyl/bupivacaine mixtures for obstetric analgesia. ANESTHESIOLOGY 67:403–407, 1987
33. Viscomi CM, Hood DD, Melone PJ, Eisenach JC: Fetal heart rate variability after epidural fentanyl during labor. Anesth Analg 71:679–683, 1990
34. Brockway MS, Noble DW, Sharwood-Smith GH, McClure JH: Profound respiratory depression after extradural fentanyl. Br J Anaesth 64:243–245, 1990