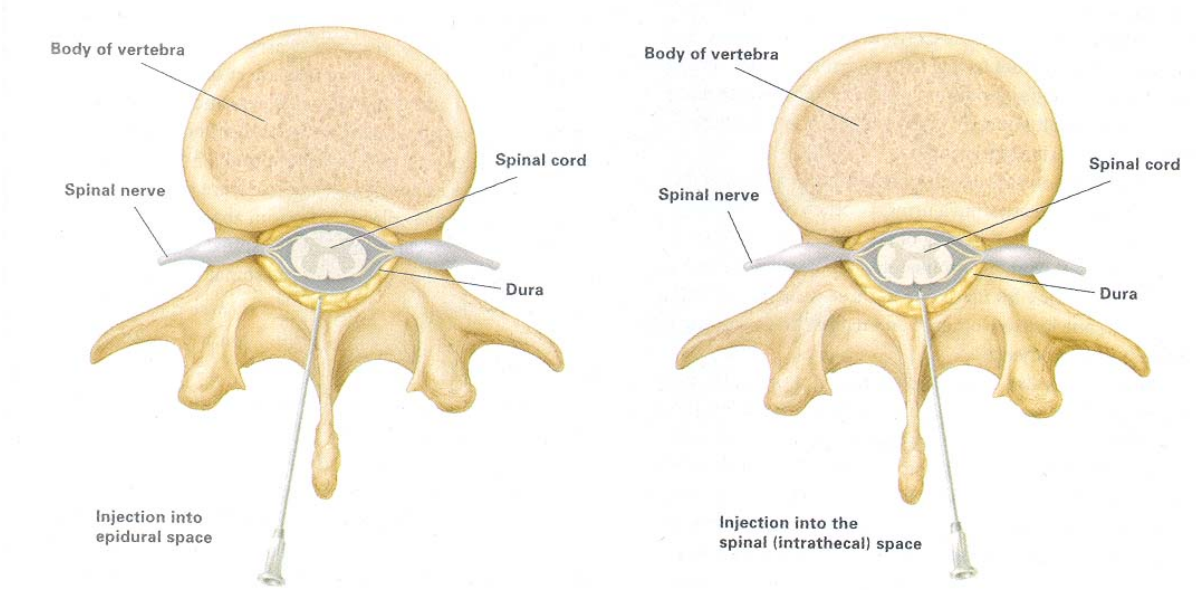
The Hidden Risks of Epidurals

A common intervention, epidurals are given to reduce pain during birth. But at what cost? A leading Australian physician discusses how this invasive procedure actually impedes labor - and harms both mother and baby.

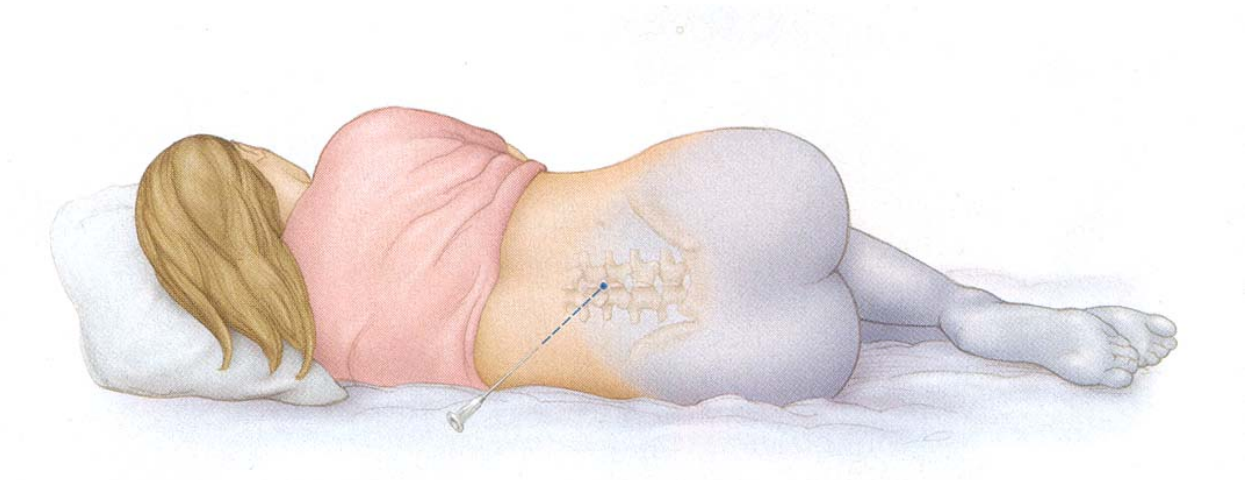
By Sarah J Buckley
Illustrations by Brian Evans

The first recorded use of an epidural was in 1885, when New York neurologist J. Leonard Corning injected cocaine into the back of a patient suffering from "spinal weakness and seminal incontinence."[1] More than a century later, epidurals have become the most popular method of analgesia, or pain relief, in US birth rooms. In 2002, almost two-thirds of laboring women, including 59 percent of women who had a vaginal birth, reported that they were administered an epidural.[2] In Canada in 2001-2002, around half of women who birthed vaginally used an epidural,[3] and in the UK in 2003-2004, 21 percent of women had an epidural before or during delivery.[4]

Epidurals involve the injection of a local anesthetic drug (derived from cocaine) into the epidural space-the space around (epi) the tough coverings (dura) that protect the spinal cord. A conventional epidural will numb or block both the sensory and motor nerves as they exit from the spinal cord, giving very effective pain relief for labor but making the recipient unable to move the lower part of her body. In the last five to ten years, epidurals have been developed with lower concentrations of local anesthetic drugs, and with combinations of local anesthetics and opiate painkillers (drugs similar to morphine and meperidine) to reduce the motor block. They produce a so-called walking epidural.



Spinal analgesia has also been increasingly used in labor to reduce the motor block. Spinals involve drugs injected right through the dura and into the spinal (intrathecal) space, and they produce only short-term analgesia. To prolong the painrelieving effect for labor, epidurals are now being coadministered with spinals, as a combined spinal epidural (CSE).



This illustration shows the entry point for the epidural drip; the shading indicates the part of the woman's body that becomes numb.

Epidurals and spinals offer laboring women the most effective form of pain relief available, and women who have used these analgesics rate their satisfaction with pain relief as very high. However, satisfaction with pain relief does not equate with overall satisfaction with birth,[5] and epidurals are associated with major disruptions to the processes of birth. These disruptions can interfere with a woman's ultimate enjoyment of and satisfaction with her labor experience, and they may also compromise the safety of birth for the mother and baby.

Epidurals and labor hormones

Epidurals significantly interfere with some of the major hormones of labor and birth, which may explain their negative effect on the processes of labor.[6] As the World Health Organization comments, “epidural analgesia is one of the most striking examples of the medicalization of normal birth, transforming a physiological event into a medical procedure.”[7]

For example, oxytocin, known as the hormone of love, is also a natural uterotonic - a substance that causes a woman's uterus to contract in labor. Epidurals lower the mother's release of oxytocin[8] or stop its normal rise during labor.[9] The effect of spinals on oxytocin release is even more marked.[10] Epidurals also obliterate the maternal oxytocin peak that occurs at birth[11] - the highest of a mother's lifetime - which catalyzes the final powerful contractions of labor and helps mother and baby fall in love at first meeting. Another important uterotonic hormone, prostaglandin F2 alpha, is also reduced in women using an epidural.[12]

Beta-endorphin is the stress hormone that builds up in a natural labor to help the laboring woman transcend pain. Beta-endorphin is also associated with the altered state of consciousness that is normal in labor. Being "on another planet;' as some describe it, helps the mother-to-be to work instinctively with her body and her baby, often using movement and sounds. Epidurals reduce the laboring woman's release of beta-endorphin.[13, 14] Perhaps the widespread use of epidurals reflects our difficulty with supporting women in this altered state, and our cultural preference for laboring women to be quiet and acquiescent.

Adrenaline and noradrenaline (epinephrine and norepinephrine, collectively known as catecholamines, or CAs) are also released under stressful conditions, and levels naturally increase during an unmedicated labor.[15] At the end of an undisturbed labor, a natural surge in these hormones gives the mother the energy to push her baby out and makes her excited and fully alert at first meeting with her baby. This surge is known as the fetal ejection reflex.[16]

However, labor is inhibited by very high CA levels, which may result when the laboring woman feels hungry, cold, fearful, or unsafe.[17] This response makes evolutionary sense:
If the mother senses danger, her hormones will slow or stop labor and give her time to flee to find a safer place to birth.

Epidurals reduce the laboring woman's release of CAs, which may be helpful if high levels are inhibiting her labor. However, a reduction in the final CA surge may contribute to the difficulty that women laboring with an epidural can experience in pushing out their babies, and to the increased risk of instrumental delivery (forceps and vacuum) that accompanies the use of an epidural (see below).

Effects of the process of labor

Epidurals slow labor, possibly through the above effects on the laboring woman's oxytocin release, although there is also evidence from animal research that the local anesthetics used in epidurals may inhibit contractions by directly affecting the muscle of the uterus.[18]

On average, the first stage of labor is 26 minutes longer in women who use an epidural, and the second, pushing stage is 15 minutes longer.[19] Loss of the final oxytocin peak probably also contributes to the doubled risk of an instrumental delivery-vacuum or forceps-for women who use an epidural,[20] although other mechanisms may be involved.

For example, an epidural also numbs the laboring woman's pelvic floor muscles, which are important in guiding her baby's head into a good position for birth. When an epidural is in place, the baby is four times more likely to be persistently posterior (POP, or face up) in the final stages of labor - 13 percent compared to 3 percent for women without an epidural, according to one study.[21] A POP position decreases the chance of a spontaneous vaginal delivery (SVD); in one study, only 26 percent of first-time mothers (and 57 percent of experienced mothers) with POP babies experienced an SVD; the remaining mothers had an instrumental birth (forceps or vacuum) or a cesarean.[22]

Anesthetists have hoped that a low-dose or combined spinal epidural would reduce the chances of an instrumental delivery, but the improvement seems to be modest. In one study, the Comparative Obstetric Mobile Epidural Trial (COMET), 37 percent of women with a conventional epidural experienced instrumental births, compared with 29 percent of women using low-dose epidurals and 28 percent of women using combined spinal epidurals.[23]

For the baby, instrumental delivery can increase the short-term risks of bruising, facial injury, displacement of the skull bones, and cephalohematoma (blood clot under the scalp).[24] The risk of intracranial hemorrhage (bleeding inside the brain) was increased in one study by more than four times for babies born by forceps compared to those with spontaneous births,[25] although two studies showed no detectable developmental differences for forceps-born children at five years old.[26, 27] Another study showed that when women with an epidural had a forceps delivery, the force used by the clinician to deliver the baby was almost twice the force used when an epidural was not in place.[28]

Epidurals also increase the need for Pitocin to augment labor, probably due to the negative effect on the laboring woman's own release of oxytocin. Women laboring with an epidural in place are almost three times more likely to be administered Pitocin.[29] The combination of epidurals and Pitocin, both of which can cause abnormalities in the fetal heart rate (FHR) that indicate fetal distress, markedly increases the risk of operative delivery (forceps, vacuum, or cesarean delivery). In one Australian survey, about half of first-time mothers who were administered both an epidural and Pitocin had an operative delivery.[30]

The impact of epidurals on the risk of cesarean is contentious; differing recent reviews suggest no increased risk[31] and an increase in risk of 50 percent.[32] The risk is probably most significant for women having an epidural with their first baby.[33]

Note that the studies used to arrive at these conclusions are mostly randomized controlled trials in which the women who agree to participate are randomly assigned to either epidural or nonepidural pain relief. Nonepidural pain relief usually involves the administration of opiates such as meperidine (aka pethidine). Many of these studies are flawed from high rates of crossover-women who were assigned to nonepidurals but who ultimately did have epidurals, and vice versa. Also, noting that there are no true controls-that is, women who are not using any form of pain relief-these studies cannot tell us anything about the impact of epidurals compared to birth without analgesic drugs.

Epidural techniques and side effects

The drugs used in labor epidurals are powerful enough to numb, and usually paralyze, the mother's lower body, so it is not surprising that there can be significant side effects for mother and baby. These side effects range from minor to life threatening and depend, to some extent, on the specific drugs used.

Many of the epidural side effects mentioned below are not improved with low-dose or walking epidurals, because women using these techniques may still receive a substantial total dose of local anesthetic, especially when continuous infusions and/or patient-controlled boluses (single large doses) are used.[34] The addition of opiate drugs in epidurals or CSEs can create further risks for the mother, such as pruritus (itching) and respiratory depression (see below).

Maternal side effects

The most common side effect of epidurals is a drop in blood pressure. This effect is almost universal and is usually preempted by administering IV fluids before placing an epidural. Even with this “preloading”, episodes of significant low blood pressure (hypotension) occur for up to half of all women laboring with an epidural,[35, 36] especially in the minutes following the administration of a drug bolus. Hypotension can cause complications ranging from feeling faint to cardiac arrest[37] and can also affect the baby's blood supply (see below). Hypotension can be treated with more IV fluids and, if severe, with injections of epinephrine (adrenaline).

Other common side effects of epidurals include inability to pass urine (necessitating a urinary catheter) for up to two-thirds of women;[38] itching of the skin (pruritus) for up to two-thirds of women administered an opiate drug via epidural;[39, 40] shivering for up to one in three women;[41] sedation for around one in five women;[42] and nausea and vomiting for one in twenty women.[43]

Epidurals can also cause a rise in temperature in laboring women. Fever over 100.4E F (38E C) during labor is five times more likely overall for women using an epidural;[44] this rise in temperature is more common in women having their first babies, and more marked with prolonged exposure to epidurals.[45] For example, in one study. 7 percent of first-time mothers laboring with an epidural were feverish after six hours, increasing to 36 percent after 18 hours.[46] Maternal fever can have a significant effect on the baby (see below).

Opiate drugs, especially administered as spinals, can cause unexpected breathing difficulties for the mother, which may come on hours after birth and may progress to respiratory arrest. One author comments, "Respiratory depression remains one of the most feared and least predictable complications of ... intrathecal [spinal] opioids.[47]

Many observational studies have found an association between epidural use and bleeding after birth (postpartum hemorrhage).[48, 49, 50, 51, 52, 53] For example, a large UK study found that women were twice as likely to experience postpartum hemorrhaging when they used an epidural in labor.[54] This statistic may be related to the increase in instrumental births and perineal trauma (causing bleeding), or may reflect some of the hormonal disruptions mentioned above.

An epidural gives inadequate pain relief for 10 to 15 percent of women,[55] and the epidural catheter needs to be reinserted in about 5 percent.[56] For around 1 percent of women, the epidural needle punctures the dura (dural tap); this usually causes a severe headache that can last up to six weeks, but can usually be treated by an injection into the epidural space.[57, 58]

More serious side effects are rare. If epidural drugs are inadvertently injected into the bloodstream, local anesthetics can cause toxic effects such as slurred speech, drowsiness, and, at high doses, convulsions. This error occurs in around one in 2,800 epidural insertions.[59] Overall, life-threatening reactions occur for around one in 4,000 women.[60, 61, 62, 63] Death associated with an obstetric epidural is very rare,[64] but it can be caused by cardiac or respiratory arrest, or by an epidural abscess that develops days or weeks afterward.

Later complications include weakness and numbness in 4 to 18 per 10,000 women. Most of these complications resolve spontaneously within three months.[65, 66, 67, 68, 69] Longer-term or permanent problems can arise from damage to a nerve during epidural placement; from abscess or hematoma (blood clot), which can compress the spinal cord; and from toxic reactions in the covering of the spinal cord, which can lead to paraplegia.[70]

Side effects for the baby

Some of the most significant and well-documented side effects for the unborn baby (fetus) and newborn derive from effects on the mother. These include, as mentioned above, effects on her hormonal orchestration, blood pressure, and temperature regulation. As well, drug levels in the fetus and newborn may be even higher than in the mother,[71] which may cause direct toxic effects. For example, epidurals can cause changes in the fetal heart rate (FHR) that indicate that the unborn baby is lacking blood and oxygen. This effect is well known to occur soon after the administration of an epidural (usually within the first 30 minutes), can last for 20 minutes, and is particularly likely following the use of opiate drugs administered via epidural and spinal. Most of these changes in FHR will resolve themselves spontaneously with a change in position. More rarely, they may require drug treatment.[72] More severe changes, and the fetal distress they reflect, may require an urgent cesarean.

Note also that the use of opiate drugs for labor analgesia can also cause FHR abnormalities. This process makes the real effects of epidurals on FHR hard to assess because, in almost all randomized trials, epidurals are compared with meperidine or other opiate drugs.

One researcher notes that the supine position (lying on the back) may contribute significantly to hypotension and FHR abnormalities when an epidural is in place.[73] Another found that the supine position (plus epidural) was associated with a significant decrease in the oxygen supply to the baby's brain (fetal cerebral oxygenation).[74]

The baby can also be affected by an epidural-induced rise in the laboring mother's temperature. In one large study of first-time mothers, babies born to febrile (feverish) mothers, 97 percent of whom had received epidurals, were more likely than babies born to afebrile mothers to be in poor condition (low Apgar score); have poor tone; require resuscitation (11.5 percent versus 3 percent); or have seizures in the newborn period.[75] One researcher noted a tenfold increase in risk of newborn encephalopathy (signs of brain damage) in babies born to febrile mothers.[76]

Maternal fever in labor can also directly cause problems for the newborn. Because fever can be a sign of infection involving the uterus, babies born to febrile mothers are almost always evaluated for infection (sepsis). Sepsis evaluation involves prolonged separation from the mother, admission to special care, invasive tests, and, most likely, administration of antibiotics until test results are available. In one study of first-time mothers, 34 percent of epidural babies were given a sepsis evaluation compared to 9.8 percent of nonepidural babies.[77]

Drugs and Toxicity

Every drug that the mother receives in labor will pass through the placenta to her baby, who is more vulnerable to toxic effects. The maximum effects are likely to be at birth and in the hours immediately after, when drug levels are highest.

There are few studies of the condition of epidural babies at birth, and almost all of these compare babies born after epidurals with babies born after exposure to opiate drugs, which are known to cause drowsiness and difficulty with breathing. These studies show little difference between epidural and nonepidural (usually opiate-exposed) babies in terms of Apgar score and umbilical-cord pH, both of which reflect a baby's condition at birth.[78] However, a large-population survey from Sweden found that use of an epidural was significantly associated with a low Apgar score at birth.[79]

There are also reports of newborn drug toxicity from epidural drugs, especially opiates administered via epidural.[80] Newborn opiate toxicity seems more likely with higher dose regimes, including those where the mother is able to self-administer extra doses, although there are wide differences in individual newborn sensitivity.[81]

It is important to note that a newborn baby's ability to process and excrete drugs is much less than an adult's. For example, the half-life (time to reduce drug blood levels by half) for the local anesthetic bupivacaine (Marcaine) is 8.1 hours in the newborn, compared to 2.7 hours in the mother.[82] Also, drug blood levels may not accurately reflect the baby's toxic load because drugs may be taken up from the blood and stored in newborn tissues such as the brain and liver,[83] from where they are more slowly released.[84]

A recent review also found higher rates of jaundice for epidural-exposed babies. This result may be related to the increase in instrumental deliveries or to the increased use of Pitocin.[85]

Neurobehavioral effects

The effects of epidural drugs on newborn neurobehavior (behavior that reflects brain state) are controversial. Older studies comparing babies exposed to epidurals with babies whose mothers received no drugs have found significant neurobehavioral effects, whereas more recent findings from randomized controlled trials (which, as noted, compare epidural- and opiate-exposed newborns) have found no differences. However, these older studies also used the more comprehensive (and difficult to administer) Brazelton Neonatal Behavioral Assessment Score (NBAS, devised by pediatricians), whereas more recent tests have used less complex procedures, especially the Neurologic and Adaptive Capacity Score (NACS, devised by anesthesiologists), which aggregates all data into a single figure and which has been criticized as insensitive and unreliable.[86, 87, 88]

For example, all three studies comparing epidural exposed with unmedicated babies, and using the NBAS, found significant differences between groups:[89]

Ann Murray et al. compared 15 unmedicated with 40 epidural-exposed babies and found that the epidural babies still had a depressed NBAS score at five days, with particular difficulty controlling their state. Twenty babies whose mothers had received oxytocin as well as an

epidural had even more depression of NBAS scores, which may be explained by their higher rates of jaundice. At one month, epidural mothers found their babies “less adaptable, more intense and more bothersome in their behavior.” These differences could not be explained by the more difficult deliveries and subsequent maternal-infant separations associated with epidurals.[90]

Carol Sepkoski et al. compared 20 epidural babies with 20 unmedicated babies, and found less alertness and ability to orient for the first month of life. The epidural mothers spent less time with their babies in the hospital, in direct proportion to the total dose of bupivacaine administered.[91]

Deborah Rosenblatt et al. tested epidural babies with NBAS over six weeks and found maximal depression on the first day. Although there was some recovery, at three days epidural babies still cried more easily and more often; aspects of this problem ("control of state") persisted for the full six weeks.[92]

Although these older studies used conventional epidurals, the total dose of bupivacaine administered to the mothers (in these studies, mean doses of 61.6 mg,[93] 112.7 mg[94] and 119.8 mg,[95] respectively) was largely comparable to more recent low-dose studies (for example, 67.5 mg[96] 91.1 mg[97] and 101.1 mg[98]).

These neurobehavioral studies highlight the possible impact of epidurals on newborns and on the evolving mother-infant relationship. In their conclusions, the researchers express concern about “the importance of first encounters with a disorganized baby in shaping maternal expectations and interactive styles.”[99]

Animal Studies

Animal studies suggest that the disruption of maternal hormones caused by epidurals, described above, may also contribute to maternal-infant difficulties. Researchers who administered epidurals to laboring sheep found that the epidural ewes had difficulty bonding to their newborn lambs, especially those in first lambing with an epidural administered early in labor.[100]

There are no long-term studies of the effects of epidural analgesia on exposed human offspring. However, studies on some of our closest animal relatives give cause for concern. M. S. Golub et al. administered epidural bupivacaine to pregnant rhesus monkeys at term and followed the development of the exposed offspring to age 12 months (equivalent to four years in human offspring). She found that milestone achievement was abnormal in these monkeys: at six to eight weeks they were slow in starting to manipulate, and at ten months the increase in “motor disturbance behaviors” that normally occurs was prolonged.[101] The author concludes, “These effects could occur as a result of effects on vulnerable brain processes during a sensitive period, interference with programming of brain development by endogenous [external] agents or alteration in early experiences.”[102]

Breastfeeding

As with neurobehavior, effects on breastfeeding are poorly studied, and more recent randomized controlled trials comparing exposure to epidural and opiate drugs are especially misleading because opiates have a well-recognized negative effect on early breastfeeding behavior and success.[103, 104, 105, 106, 107]

Epidurals may affect the experience and success of breastfeeding through several mechanisms. First, the epidural-exposed baby may have neurobehavioral abnormalities caused by drug exposure that are likely to be maximal in the hours following birth-a critical time for the

initiation of breast feeding. Recent research has found (rather obviously) that the higher the newborn's neurobehavior score, the higher his or her score for breastfeeding behavior.[108]

In another study, the baby's breastfeeding abilities, as measured by the Infant Breastfeeding Assessment Tool (IBFAT), were highest among unmedicated babies, lower for babies exposed to epidurals or IV opiates, and lowest for babies exposed to both. Infants with lower scores were weaned earlier, although overall, similar numbers in all groups were breastfeeding at six weeks.[109] In other research, babies exposed to epidurals and spinals were more likely to lose weight in the hospital, which may reflect poor feeding efficiency.[110] Other research has suggested that newborn breastfeeding behavior and NACS scores may be normal when an ultra-low-dose epidural is used, although even in this study, babies with higher drug levels had lower neurobehavior (NACS) scores at two hours.[111]

Second, epidurals may affect the new mother, making breastfeeding more difficult. This situation is likely if she has experienced a long labor, an instrumental delivery, or separation from her baby, all of which are more likely following an epidural. Hormonal disruptions may also contribute, as oxytocin is a major hormone of breastfeeding.

One study found that babies born after epidurals were less likely to be fully breastfed on hospital discharge; this was a special risk for epidural mothers whose babies did not feed in the first hour after birth.[112] A Finnish survey records that 67 percent of women who had labored with an epidural reported partial or full formula feeding in the first 12 weeks compared to 29 percent of nonepidural mothers; epidural mothers were also more likely to report having “not enough milk.”[113]

Two groups of Swedish researchers have looked at the subtle but complex breastfeeding and prebreastfeeding behavior of unmedicated newborns. One group has documented that when placed skin-to-skin on the mother's chest, a newborn can crawl up, find the nipple, and self-attach.[114] Newborns affected by opiate drugs in labor or separated from their mothers briefly after birth lose much of this ability. The other Swedish group found that newborns exposed to labor analgesia (mostly opiates, but including some epidurals) were also disorganized in their prefeeding behavior - nipple massage and licking, and hand sucking - compared to unmedicated newborns.[115]

Satisfaction with birth

Obstetric care providers have assumed that control of pain is the foremost concern of laboring women and that effective pain relief will ensure a positive birth experience. In fact, there is evidence that the opposite may be true. Several studies have shown that women who use no labor medication are the most satisfied with their birth experience at the time,[116] at six weeks,[117] and at one year after the birth.[118] In a UK survey of 1,000 women, those who had used epidurals reported the highest levels of pain relief but the lowest levels of satisfaction with the birth, probably because of the higher rates of intervention.

Finally, it is noteworthy that caregiver preferences may to a large extent dictate the use of epidurals and other medical procedures for laboring women. One study found that women under the care of family physicians with a low mean use of epidurals were less likely to receive monitoring and Pitocin, to deliver by cesarean, and to have their babies admitted to newborn special care.[119]

Conclusion

Epidurals have possible benefits but also significant risks for the laboring mother and her baby. These risks are well documented in the medical literature but may not be disclosed to the laboring woman. Women who wish to avoid the use of epidurals are advised to choose

caregivers and models of care that promote, support, and understand the principles and practice of natural and undisturbed birth.

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