

Impact of Birthing Practices on the Breastfeeding Dyad

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For breastfeeding to start and continue, the newborn must be able to suck, swallow, and breathe; the mother must be able and willing to let her infant breastfeed; and surroundings must support the biological unit: the mother–baby dyad. This article reviews how birth practices, including epidural anesthesia, cesarean surgery, forceps, and vacuum extraction, can affect the newborn's ability to feed, the mother's motivation and lactation capacity, and the mother–baby relationship. *J Midwifery Womens Health* 2007;52:621–630 © 2007 by the American College of Nurse-Midwives.

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INTRODUCTION

Did you know that a newborn uses six out of the 12 cranial nerves; 22 bones connecting at 34 sutures; and 60 voluntary and involuntary muscles to suck, swallow, and breathe in a coordinated activity? Furthermore, this process occurs at 40 to 60 cycles/minute, 10 to 30 minutes at a stretch, and 8 to 16 times a day or more. Several common health care practices during labor, birth, and the immediate postpartum period can adversely affect this mechanism and ultimately, breastfeeding success. Mechanical forces can disrupt the infant's cranium and other body parts; sequelae from labor analgesics and anesthetics affect the infant's alertness and muscle coordination; and some common practices in modern labor and delivery settings can affect the mother's motivation and lactation capacity. This article describes the adverse effects of birth practices on cranial nerves that can hinder breastfeeding initiation. In addition, some of the long-term effects of birth interventions and recent policy initiatives that link birth practices to breastfeeding outcomes are reviewed.

The concept that "birth practices affect breastfeeding" is not new. More than 2 decades ago, the Pan American Health Organization (PAHO) and World Health Organization/Europe (WHO/Euro) discouraged the use of non-evidence-based practices. Recommendations were put forth calling for the early initiation of breastfeeding, and no separation of mother and baby.¹ The WHO and United Nations Children's Fund (UNICEF) 1989 *Joint Statement on the Special Role of Maternity Services* states that "anesthesia, strong sedation, prolonged labour, surgical intervention, and other sources of stress, discomfort and fatigue for mothers and infants impede the initiation of lactation."² The 2006 Expanded and Integrated Baby-Friendly Hospital Initiative (BFHI) program includes a mother-friendly childbirth module.³ Foster et al.⁴ recently reviewed the literature on breastfeeding

initiation and birth setting practices, and concluded that intrapartum care should include implementation of the BFHI Ten Steps and BFHI designation.

Unfortunately, few studies of birth practices address breastfeeding outcomes. Jordan et al.⁵ described the dilemma of establishing cause and effect of birth medications on infant feeding outcomes:

"Because 'failure to breastfeed' is not recognized as a possible harmful effect of medication, there are few methodological precedents in this area. The complex, but under researched, physiological processes involved in establishing lactation are not generally considered vulnerable to pharmacological influences. The transitory nature and "ordinariness" of "switching to bottle feeding" render the usual algorithms for identifying adverse drug reactions inadequate, inapplicable, or even irrelevant. Susceptibility to bottle feeding is often regarded as determined exclusively by socio-cultural factors. The possibility of an additional dose-related impact of medication has not previously been explored in this context."

In other words, breastfeeding initiation and continuance is generally viewed as solely the mother's decision; therefore, interventions have been focused on maternal motivation. The newborn's role in breastfeeding initiation, especially the ability to suck, swallow, and breathe normally, was assumed to be a "given" except when obvious abnormalities were present. In addition, professional segmentation makes it difficult for some providers to see the short- and long-term outcomes of their practices: obstetricians are rarely involved in establishment of breastfeeding; anesthesiologists are only peripherally involved in pediatric care; and pediatricians rarely interface with mothers before birth.

MATERNAL CONFIDENCE

The mother's confidence and trust in her ability to birth leads to confidence in her ability to breastfeed. Staff attitudes matter in this regard: a positive, encouraging, proactive "you can do this" philosophy is empowering.

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Several practices discourage and undermine breastfeeding, including but not limited to⁶: laboring alone; lying in bed; supine position; staying immobile; food and drink withheld; intravenous fluids administered; chemical induction and/or augmentation of labor; use of opiates for pain, including those administered in the epidural space; cesarean delivery; operative vaginal births with either forceps and/or vacuum extractor devices; and prolonged labor,⁷ especially labors with a fetus in the occiput posterior position. However, these birth practices do not affect the mother alone. The same practices have adverse effects on the newborn.

THE EFFECT OF BIRTH EVENTS ON CRANIAL ANATOMY

During labor and birth, the infant's skull is subjected to mechanical forces that may disrupt bony configuration/alignment, affect cranial and thoracic nerves, and compress brain and central nervous system structures. Twenty-two bones, or segments of bone, articulate at 34 sutures/places, allowing for molding during the cardinal movements. For example, prenatally, the occiput has 4 segments; the frontal bone is in 2 segments, and the temporal bones are in 3 segments. Bony segments fuse at different times during childhood, and some remain open until adulthood.⁸

The 12 paired cranial nerves issue from the brain and, like spinal nerves, have both afferent (sensory) fibers and efferent (motor) fibers. Six of the 12 cranial nerves that are involved in sucking, swallowing, and/or breathing, pass through tiny foramen between the bony segments of the cranium. Mechanical forces to the cranium during labor can disrupt nerve function or cause nerve entrapment. Forces from excess or unusual pressures can potentially disrupt nerve function for a longer time.

Cranial Nerve V

Cranial nerve V (the trigeminal nerves; [Figure 1](#)) contain sensory fibers from the palate, tongue, lower jaw, nose, and motor fibers that control some muscles used in mastication. Forceps, which are placed over the parietal bone and mandible, can cause bruising and damage that compromises the function of motor fibers of the trigeminal nerve. Term newborns who do not experience an operative vaginal or abdominal delivery can crawl to the breast unassisted and begin breastfeeding, partly using their sense of smell,⁹ touch, and taste. Newborns who do experience an operative birth or who were exposed to anesthetics often have difficulty crawling to the breast, latching, and sucking.¹⁰

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Cranial Nerve VII

Cranial nerve VII (the facial nerves; [Figure 2](#)) contain sensory fibers from the palate, anterior two-thirds of the tongue, and tear ducts; and motor nerves that innervate the facial muscles, lips, cheeks, and jaw. The infant's suck response is triggered partly by tactile receptors in the lips and palate. Motor fibers of cranial nerve VII are involved in rooting, latching, and sucking responses. This nerve emerges from the cranium in the stylomastoid foramen between the temporal bone and mastoid and styloid processes. Any compromise to the facial nerve could theoretically affect latching and sucking.¹¹ This concept has not yet been sufficiently investigated.

Cranial Nerves IX, X, and XI

Passing through the jugular foramen between the temporal and occipital bones are three cranial nerves that affect suck, swallow, and/or breathing. The jugular foramen lies between 2 segments of the occipital and 3 segments of the temporal bone. In theory, misalignment of bony segments following traumatic birth events can affect nerve function in any or all of these nerves and/or the jugular vein.

Cranial nerve IX (the glossopharyngeal nerve; [Figure 3](#)) has sensory fibers from the posterior palate and tongue which controls the gag response; motor fibers of cranial nerve IX control muscles of mastication. Suctioning and intubation may trigger the sensory fibers, causing hyper-responsive gagging which in turn can inhibit deep latch at breast. The tip of the nipple extends almost to the hard-soft palate junction in normal breastfeeding.¹² Shallow latch is a common cause or contributing factor to nipple pain and damage and poor milk transfer.

Cranial nerve X (the vagus nerve; [Figure 4](#)) has motor fibers to the larynx, heart, lungs, trachea, and gastrointestinal tract; and sensory fibers from the heart, lungs, trachea, bronchi, larynx, pharynx, gastrointestinal tract, and external ear. It is possible that disruption of cranial nerve X is responsible for some of the high-pitched squeals produced by some babies with poor suck. The vagus controls breathing and heart function, therefore any disruption of vagal function could interfere with suck-swallow-breathe coordination.

Cranial nerve XI (the spinal accessory nerve; [Figure 5](#)) controls the sternocleidomastoid and trapezius muscles, therefore involved in torticollis, head position, and airway patency—all of which are known to affect sucking, swallowing, and breathing.¹³

Cranial Nerve XII

During cesarean surgery, the surgeon's hands lift the infant's skull out of the uterine incision by placing pressure on the two condylar segments of the occiput (the cranial base). The bilateral cranial nerve XII

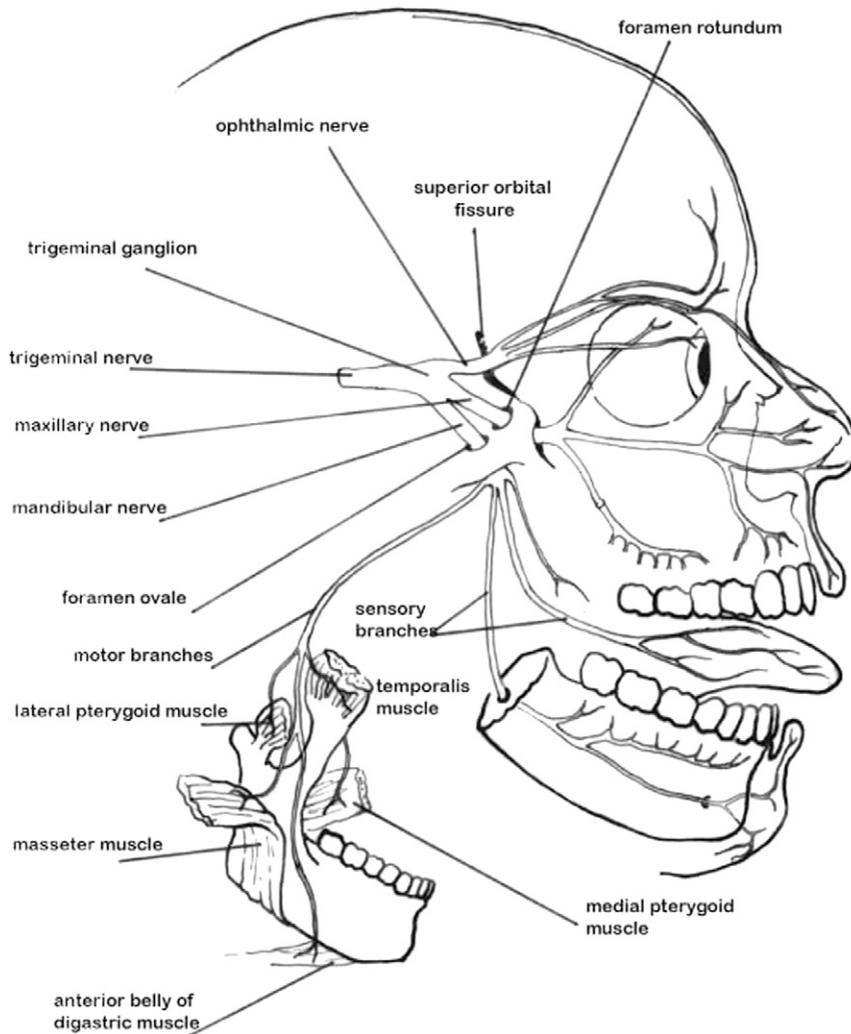


Figure 1. Cranial nerve V (trigeminal nerve). Reprinted with permission from Linda J. Smith.

(hypoglossal nerves; [Figure 6](#)) pass through the spaces between the condylar and basio segments of the occiput; therefore, pressure at this point could disrupt the hypoglossal nerve. The anterior and posterior branches of cranial nerve XII fibers control tongue movements, producing sequential, smooth contractions of the voluntary and involuntary muscles of the tongue. Disrupted contraction patterns of the tongue muscles caused by injury, exposure to anesthetics, immaturity, and/or noxious tactile stimulation can result in nonsequential, erratic, weak, and/or mispatterned tongue movements which in turn interfere with normal sucking, swallowing, and milk intake by the infant. Evans et al.¹⁴ analyzed and compared the amount of breast milk transferred to term infants whose mothers had a cesarean birth (n = 97) with the amount transferred to newborns of women who had a spontaneous vaginal delivery (n = 88) and found that the volume of milk transferred to infants who were born by cesarean section was less than the volume received by infants whose mothers had a spontaneous vaginal

delivery over the first 6 days of life (mean of 358 ml/kg vs 450 ml/kg, respectively; $P < .05$). Evans' research supports the theory that the mechanics of cesarean surgery may disrupt the hypoglossal nerves at the cranial base.

THE EFFECT OF OPERATIVE VAGINAL BIRTH ON BREASTFEEDING

Forceps and vacuums can directly and indirectly affect breastfeeding. No studies yet report on direct effects of instruments on breastfeeding. However, lactation professionals frequently deal with indirect results.

Hall et al.¹⁵ investigated factors predicting breast feeding cessation and found that vacuum vaginal delivery was a strong predictor of early cessation of breastfeeding. Avrahami^{16,17} conducted computerized tomography (CT) scans of symptomatic term infants and observed that poor or disturbed feeding is one sign of intracranial bleeding. Vacuum extraction devices contribute to increased rates of hyperbilirubinemia and kernicterus secondary to the cre-

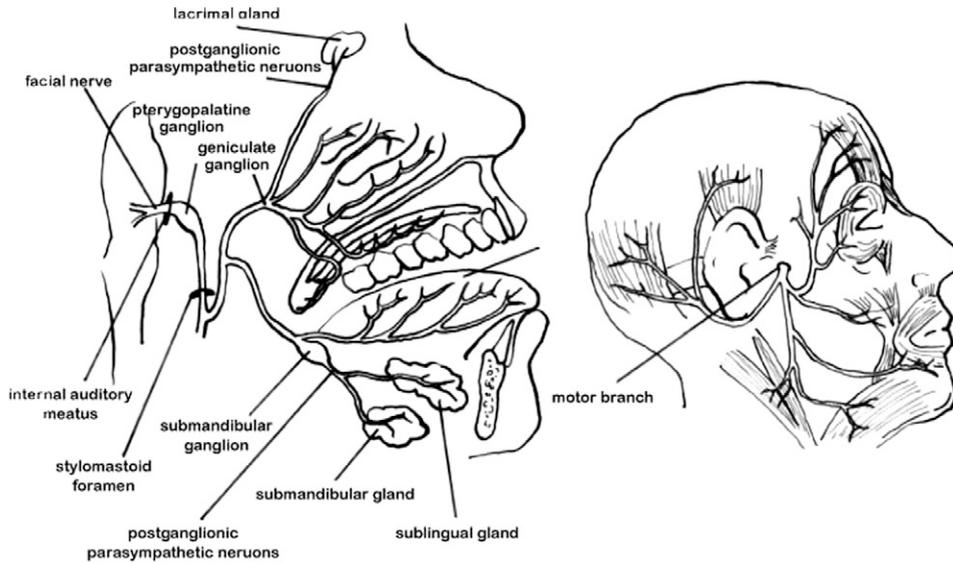


Figure 2. Cranial nerve VII (the facial nerve). Reprinted with permission from Linda J. Smith.

ation of cephalohematomas and/or bruising.¹⁸ Jaundiced babies are more lethargic and therefore feed poorly; conversely, poor feeding can cause or exacerbate jaundice. Jaundice is a frequent reason for supplementing the breast-fed baby; therefore, any practices that increase the risk of jaundice will nearly always have a negative effect on exclusive breastfeeding.

Forceps use can cause bruising and nerve damage to the sides of the infant cranium, causing the jaw to deviate to the paralyzed side when the mouth is open.¹⁹ Instruments and incisions cause more pain to the mother, but few studies have explored the role of maternal pain (other than breast pain) in breastfeeding initiation, exclusivity, or duration.

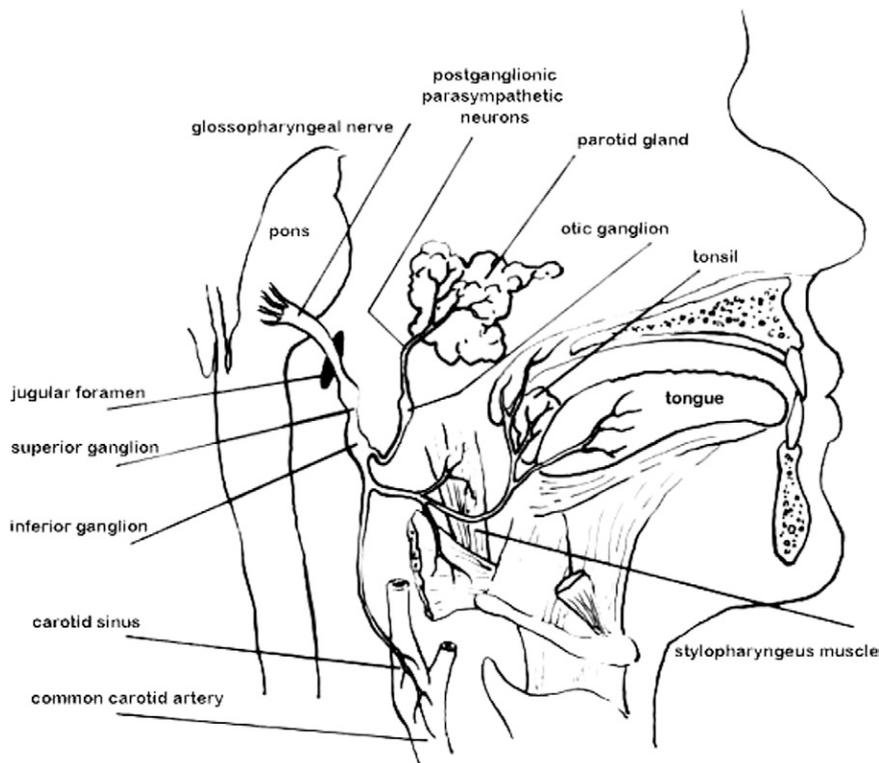


Figure 3. Cranial nerve IX (the glossopharyngeal nerve). Reprinted with permission from Linda J. Smith.

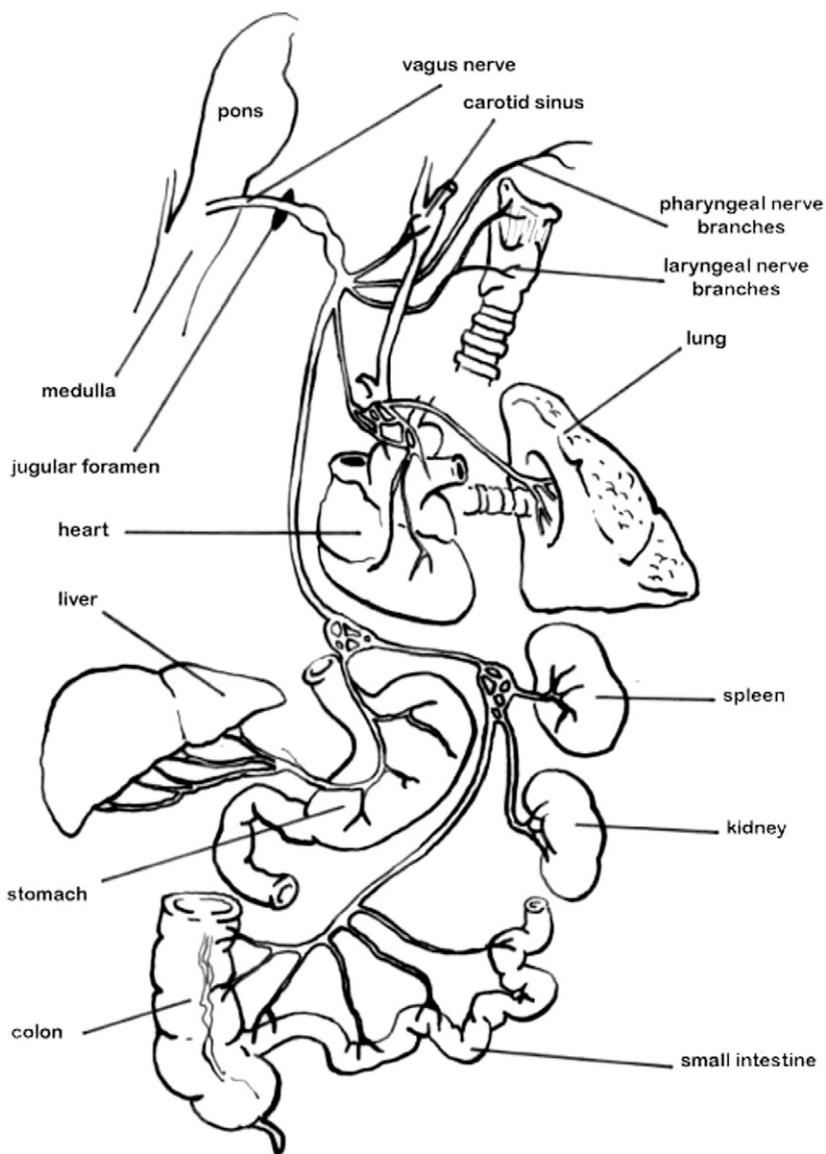


Figure 4. Cranial nerve X (the vagus nerve). Reprinted with permission from Linda J. Smith.

EFFECTS OF PHARMACOLOGIC PAIN RELIEF DURING LABOR

All drugs administered for pain relief to the laboring woman cross the placenta.²⁰ Drugs administered into the epidural space require a higher absolute dose than those administered intravenously. Most of the pain-relieving drugs used to help women during labor are highly lipid soluble and rapidly diffuse into the fetus. The pediatric half-life (PHL) of commonly used analgesics is longer than the maternal half life, including bupivacaine (PHL, 8.1 hrs) and meperidine (PHL, 6–32 hrs).²¹

Fentanyl

Fentanyl is emerging as particularly problematic for breastfeeding dyads. Jordan et al.⁵ conducted a retrospective review of the determinants of bottle feeding in 425 primigravidas who delivered term infants. Logistic re-

gression was used to control for factors known to affect infant feeding choices. After controlling for the effects of antenatal choice, other analgesics, and mode of delivery, these authors found a dose-response relationship between the dose of fentanyl used and subsequent bottle feeding at the time of hospital discharge (odds ratio [OR], 1.004; 95% confidence interval [CI], 1.000–1.008, and 90% CI for each microgram administered [range, 8–500 μg] was 1.001–1.007). Beilin et al.²² prospectively studied women who were already successful breastfeeders, randomly assigning them to high or low doses of fentanyl or no fentanyl. At 6 weeks postpartum, more women who were randomly assigned to high-dose epidural fentanyl were not breastfeeding ($n = 10$; 17%), compared to women who were randomly assigned to receive either an intermediate fentanyl dose ($n = 3$; 5%) or no fentanyl ($n = 1$; 2%; $P = .005$).

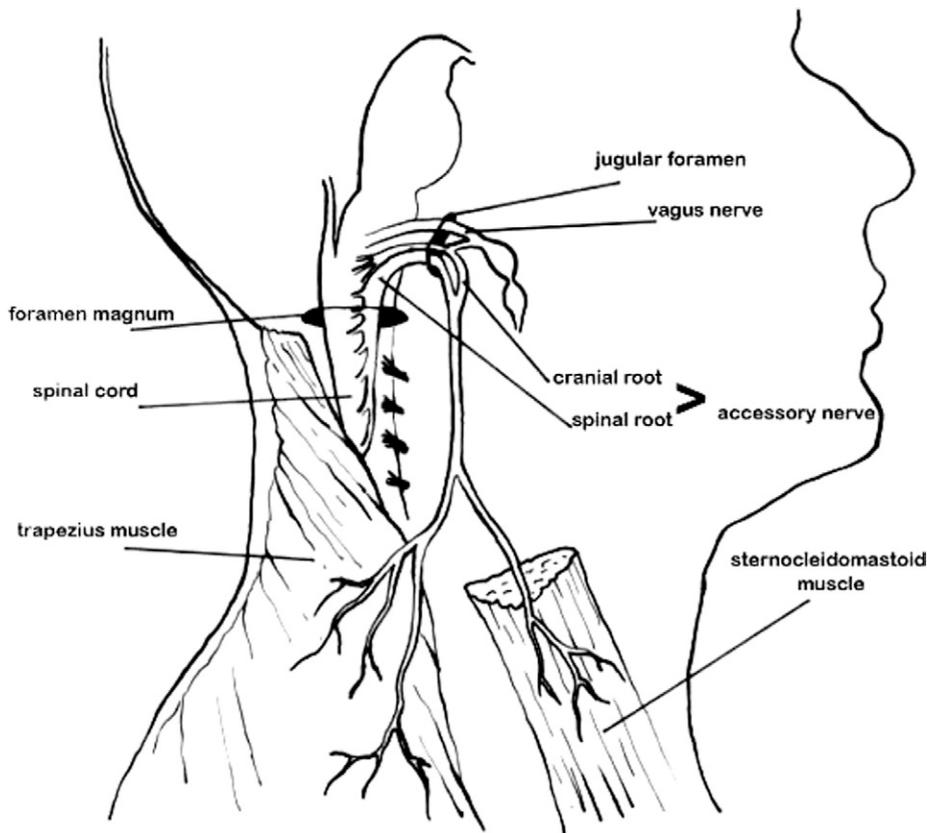


Figure 5. Cranial nerve XI (spinal accessory nerve). Reprinted with permission from Linda J. Smith.

Epidurals

Research evidence of the risks of epidurals to breastfeeding is accumulating. Mothers who use epidurals during labor when compared to mothers who do not use epidurals have less interaction with baby,²³ less mastery over motherhood,²⁴ less maternal movement in labor, more malpresentations,²⁵ and often more pain that then requires more medications.

Other sequelae of epidural use can also impact subsequent breastfeeding success. Overhydration by intravenous fluids may result in breast edema, which can cause latch and breast problems.²⁶ Although the effect of intravenous hydration on breast edema and delayed lactogenesis has not been adequately investigated, many have observed negative effects of postpartum edema of the breast.²⁶ Breast fullness (“engorgement”) on days 3 or 4 is partly caused by a rapid increase in fluid volume during lactogenesis II, which can be exacerbated by poor management practices that limit milk removal.²⁷ Some lactation professionals have observed that prolonged intravenous hydration seems to increase edema in breast tissue. Using the term “engorgement” to refer to all postpartum breast fullness is confusing, because breast edema is different from milk stasis, suggesting different management strategies. It appears that excess interstitial fluid may inhibit the expansion of milk ducts and

consequent release of milk during the milk-ejection reflex.²⁸

Dewey et al.²⁹ investigated the incidence of and risk factors for suboptimal infant breastfeeding behavior, delayed onset of lactation, and excess neonatal weight loss among mother–infant pairs in a population of women with high educational levels and motivation to breastfeed. By carefully separating infant-related problems from maternal motivation and other maternal issues affecting breastfeeding initiation and duration, they found that excess newborn weight loss was associated with primiparity, long duration of labor, use of labor medications (in multiparas), and infant status at birth. Baumgardner et al.³⁰ studied the relationship between labor epidural anesthesia and early breastfeeding success. They reported that despite the opportunity to breastfeed, many babies exposed to epidural anesthesia were unable to latch and suck effectively. In one of the first published reports in an obstetric journal of breastfeeding outcomes related to birth drugs, Volmanen et al.³¹ reported that 67% of the mothers who had labored with epidural analgesia and 29% of the mothers who labored without epidural analgesia reported partial breastfeeding or formula feeding at 12 weeks ($P = .003$). Henderson et al.³² investigated the effect of intrapartum epidural analgesia on breastfeeding duration and reported that epidural

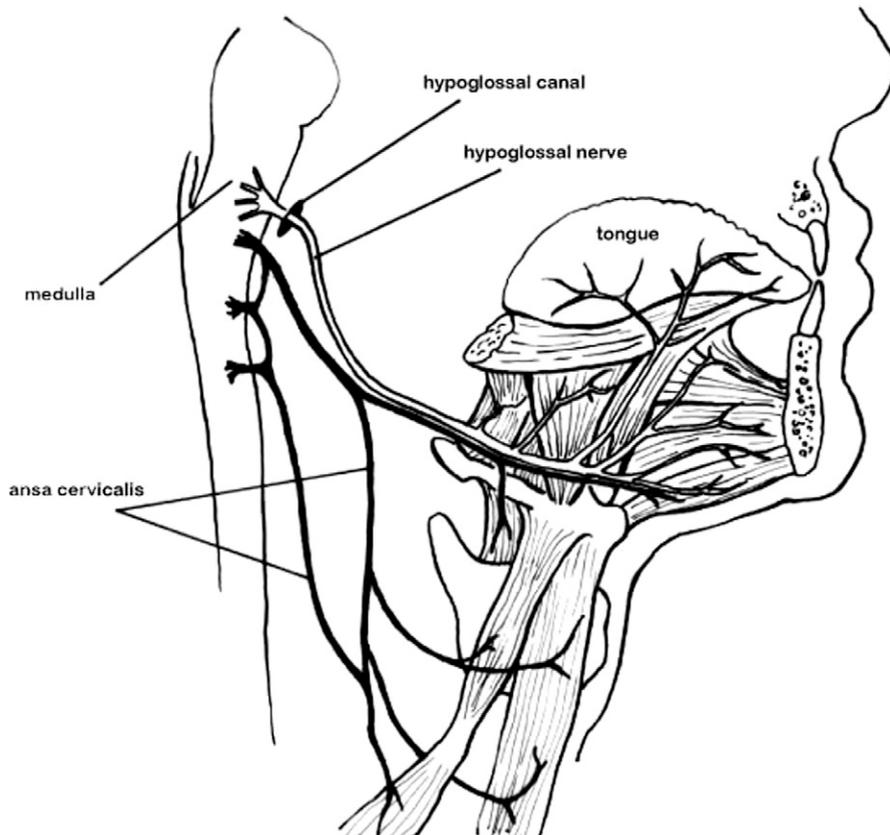


Figure 6. Cranial nerve XII (hypoglossal nerve). Reprinted with permission from Linda J. Smith.

analgesia but not narcotic analgesia was significantly associated with reduced breastfeeding duration (adjusted hazard ratio, 1.44; 95% CI, 1.04–1.99). Torvaldsen et al.³³ investigated the effects of epidural analgesia on breastfeeding initiation and continuance to 24 weeks in the Australian Capital Region, where breastfeeding initiation exceeds 90%. They reported that intrapartum analgesia and type of birth were associated with partial breastfeeding and breastfeeding difficulties in the first postpartum week ($P < .0001$). Analgesia, maternal age and education were associated with breastfeeding cessation in the first 24 weeks ($P < .0001$), with women who had epidurals being more likely to stop breastfeeding than women who used non-pharmacological methods of pain relief (adjusted hazard ratio, 2.02; 95% CI, 1.53–2.67).

Finally, the results of epidural anesthesia and operative vaginal birth may work together to further adversely affect breastfeeding. Fentanyl and bupivacaine decrease maternal pain, which decreases the production of maternal endorphins. This results in lower levels of maternally acquired endorphins in the newborn and possibly more pain in the newborn from any cause, including forceps- or vacuum-induced injuries. Colostrum has twice the amount of beta-endorphin as mother's blood, and these levels remain elevated for at least 10 days.³⁴ However, elective cesarean section without labor and some epi-

dural drugs significantly lower milk endorphin levels.³⁴ Therefore, the infant who is exposed to these labor interventions may experience higher than usual pain, will definitely be less likely to suck well, more likely to be separated, and less able to access the analgesic effects of skin-to-skin contact and breastfeeding.³⁵ Furthermore, even if the newborn remains with the mother and can suck, the milk of women who have elective cesarean sections is less “pain relieving” than the milk of women who give birth vaginally.

POSTPARTUM PRACTICES

Lactation professionals have observed problems with breastfeeding after the infant was suctioned or intubated, but no research has yet explored this association.

It is known that several postpartum practices, individually and collectively, affect the infant's ability to suck, especially if performed before the first breastfeeding. These include separation from mother for any reason. The American Academy of Pediatrics breastfeeding policy recommends that non-emergency procedures be postponed until after the first hour and first successful breastfeeding episode.³⁶

Poor latch or poor suck can rapidly cause painful, abraded, or damaged nipples. Nipple pain is a primary cause of premature weaning.³⁷ Poor feeding also results

in a hungry, fussy baby, further undermining mother's confidence in her ability to breastfeed. Poor feeding prevents milk transfer from the mother's breast to the baby, resulting in retained milk and impaired transition into lactogenesis II.³⁸ If the baby cannot breastfeed effectively directly, the mother may need even more equipment (breast pumps or feeding devices) and skilled help to establish smooth, comfortable breastfeeding. Some research indicates that early breastfeeding challenges are associated with lower rates of exclusivity and shorter duration of overall breastfeeding.³⁹

STRATEGIES FOR CHANGE—THE ROAD AHEAD

There is good news, however. There is strong global interest in the life-preserving importance of breastfeeding.^{40,41} Professionals are beginning to understand the links between birth practices and breastfeeding outcomes, with the first compilation of such research published by Kroeger and Smith.⁶ As of mid-2007, the BFHI launched by WHO and UNICEF in 1992 now boasts 20,000 birth facilities in at least 134 nations that have implemented the BFHI Ten Steps to Successful Breastfeeding. In 1996, the Coalition for Improving Maternity Services (CIMS) developed the Mother-Friendly Childbirth Initiative, and in 2007 published the *Evidence Basis for the Ten Steps of Mother-Friendly Care* in Lamaze International's *Journal of Perinatal Education*.⁴²

In 2006, WHO and UNICEF added a new module to the BFHI: mother-friendly care. Five evidence-based objectives are included in the Global Criteria educational component: "A review of the hospital policies indicates that they require mother-friendly labour and birthing practices: (1) encouraging women to have companions of their choice to provide continuous physical and/or emotional support during labour and birth, if desired; (2) allowing women to drink and eat light foods during labour, if desired; (3) encouraging women to consider the use of non-drug methods of pain relief unless analgesic or anaesthetic drugs are necessary because of complications, respecting the personal preferences of the women; (4) encouraging women to walk and move about during labour, if desired, and assume positions of their choice while giving birth, unless a restriction is specifically required for a complication and the reason is explained to the mother; (5) care that does not involve invasive procedures such as rupture of the membranes, episiotomies, acceleration or induction of labour, instrumental deliveries, or caesarean sections unless specifically required for a complication and the reason is explained to the mother."³

CONCLUSION

"As the pot is shaped, so grows the plant."⁴³ Mechanical forces on the fetal/newborn's cranial anatomy during labor and birth have not been formally studied in rela-

tionship to the infant's ability to feed normally. If an otherwise normal infant cannot latch and maintain breastfeeding immediately after birth, something is wrong. Facial, cranial, or postural asymmetry may be an indication that internal disruption of bones and/or nerves may be involved in the infant's inability to feed. Although research is lacking on effective and safe resolution of persistent asymmetry that lasts beyond 2 weeks, some clinicians have observed benefits from therapeutic intervention by a skilled provider, such as a doctor of osteopathy.⁴⁴ Additional support from skilled lactation professionals is useful.⁴⁵ Mothers will need support and guidance to express their milk and feed it to their infants for several days or weeks while the baby's immaturity resolves, injuries heal, drugs wear off, and any alignment issues are resolved. The vast majority of infants can eventually establish direct breastfeeding—the gold standard of infant feeding.

No matter what happens during labor, all professionals attending women during birth must make every effort to keep the mother–baby dyad together immediately after birth and for the early days and weeks of the newborn's life. The newborn should be immediately placed on mother's naked abdomen/chest and both should be covered to preserve body heat.⁴⁶ Suctioning is not necessary; in fact, many common non-emergency procedures disrupt the sucking response.⁴⁷ The baby will soon begin rooting, seeking the breast using sight, touch, and smell, and will make stepping movements until he or she latches on and begins to suckle. This changes the mother's behavior and triggers an especially strong burst of oxytocin, contracting the uterus, moving colostrum toward the nipple, and enhancing bonding.⁴⁸ Immediate breastfeeding in the first hour is a specific strategy to reduce pain from nipple pain and engorgement.^{27,37} The theme for World Breastfeeding Week 2007 was BFHI Step 4: *Breastfeeding: The 1st Hour—Save ONE million babies!*⁴⁹

Research has not adequately addressed many of these concepts, and the research that currently exists is often old, flawed, and/or only partly relevant. Although breastfeeding is enormously important to the health of mothers and babies, research funding in the U.S. from unbiased sources is suboptimal.⁵⁰ We must ask then, why is breastfeeding research so scant? The answer may lie in the sources of funding. Funding of research is affected by politics and economic interests, and very few corporations directly benefit when more babies are breastfed. When breastfeeding is deemed important enough to study thoroughly, then perhaps adequate research will be funded to investigate, for example, the role of intravenous fluids on the timing and physiology of lactogenesis II.

The WHO/UNICEF Global Strategy for Infant and Young Child Feeding (2003) elegantly reminds us that "Mothers and babies form an inseparable biological and

social unit; the health and nutrition of one group cannot be divorced from the health and nutrition of the other.”⁵¹

To reach the WHO/UNICEF Global Strategy recommendation of 6 months of exclusive breastfeeding, one must first achieve 6 days of exclusive breastfeeding. That means the mother and baby must emerge from birth ready and able to initiate “exerogestation” as a biologic dyad.⁵² If the mother is unwilling or unable to hold her baby skin-to-skin for many hours a day; if her breasts are too edematous to initiate lactation normally; and/or if her baby is unable to feed effectively and comfortably, then the normal course of breastfeeding is profoundly undermined.

Normal birth is the key and foundation to normal breastfeeding.

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