

DRUGS, PREGNANCY, AND LACTATION

Anesthetic Agents

Local and general anesthetic agents are commonly used in pregnancy, especially for epidural or combined spinal epidural analgesia at delivery. Although surgery requiring general anesthesia is less common, such use is still relatively frequent.

Local anesthetics are given by injection or topically, and include benzocaine, bupivacaine (Marcaine, Sensorcaine), chloroprocaine (Nesacaine), camphor, dibucaine (Nupercainal), levobupivacaine (Chirocaine), lidocaine (Xylocaine, Octocaine), mepivacaine (Carbocaine, Polocaine), pramoxine, prilocaine (Citanest), procaine (Novocaine), ropivacaine (Naropin), and tetracaine (Pontocaine). For neuraxial analgesia, low doses of bupivacaine, lidocaine, or ropivacaine – with or without a small dose of an opioid such as fentanyl – are commonly used. Use of injectable anesthetics for dental procedures also is common in pregnancy. Maternal toxicity involving the central nervous and cardiovascular systems may result from inadvertent intravenous administration or excessive doses.

Topical anesthetics are commonly used in dermatologic products; many are over-the-counter (OTC) products with multiple trade names not listed here. Such agents include benzocaine, butamben, cocaine, dibucaine, lidocaine, pramoxine, prilocaine, tetracaine, and dyclonine (a bactericidal and fungicidal local anesthetic used in lozenges and throat sprays for sore throats). The three topical cocaine products are controlled substances. Because of rapid absorption that can produce toxicity in the user, they are best avoided in pregnancy. Ethyl chloride (chloroethane) is a refrigerant used as a topical anesthetic. Although there are no reports of its use in pregnancy, the

low absorption suggests that it is safe.

Benzocaine and pramoxine are available in OTC preparations for anorectal indications, such as hemorrhoids. The human pregnancy data are limited, but because there are more than 50 such products and hemorrhoids are common in pregnancy, these agents appear to be widely used in pregnancy. Systemic absorption may occur from mucous membranes or from damaged skin with the amount absorbed dependent on the dose.

The local anesthetics available for ophthalmic use are lidocaine (Akten), proparacaine (Alcaine, Ophthetic, Paracaine), proparacaine combined with fluorescein (Fluoracaine, Fluoracaine, Flurate, Fluress, Fluorox), and tetracaine (Altacaine, Tetacaine).

In the above situations, with the exception of cocaine, the risk of any aspect of developmental toxicity from appropriate doses and administration of local anesthetics appears to be rare or nonexistent.

General anesthetics can be classified as injectable, gases, or volatile liquids. The injectable agents include droperidol (Inapsine), etomidate (Amidate), fospropofol (Lusedra), ketamine (Ketalar), methohexital (Brevital), midazolam (Versed), propofol (Diprivan), and sodium thiopental (Pentothal). The volatile liquids include desflurane (Suprane), enflurane (Ethrane), halothane (Fluothane), isoflurane (Forane), methoxyflurane (Penthrane), and sevoflurane (Ultane). All of the agents in these two categories of general anesthetics have the potential to cause neonatal depression or adverse neurobehavioral effects if used close to birth. For most agents, developmental toxicity during other periods of gestation, including organogenesis, has not been reported,

but the human pregnancy experience is either absent or very limited. Moreover, the animal reproduction data, when these agents were used alone, were reassuring.

Because nitrous oxide is a gas, concerns have been raised about the potential for adverse effects on the embryo-fetus, as well as the potential effects on women of reproductive potential working in surgical areas. Moreover, when used for surgery, nitrous oxide is always combined with other general anesthetic agents. In animals, the gas is an embryofetal toxin (growth restriction, structural anomalies, and death), but the maternal exposures were sometimes high and prolonged. Long-lasting effects reported in animals include permanent brain damage resulting in abnormal behavior effects in motor development and general activity.

In humans, reports have described spontaneous abortions, infertility, and decreased birth weight in exposed pregnancies and in women of reproductive potential working in surgical areas and dental offices. Many of these retrospective reports were subject to self-reporting and/or recall bias, as well as confounders such as lack of information on exposure dose, type of anesthesia, use of other drugs, maternal age, and smoking. Scavenging and ventilating surgical rooms will lessen the exposure of personnel, but will not completely free the area of waste gases. Fortunately, the data do not support an association between acute or chronic nitrous oxide exposure and structural anomalies, but the news for neurotoxicity is troubling.

A 2004 study compared 40 children (ages 5-13 years) born to female physicians and nurses who were exposed to waste anesthetic gases (specific agents not identified) with 40 nonexposed controls matched for age, gender, and maternal occupation. The developmental milestones in the two groups were similar, but the ex-

posed children had significantly lower gross motor ability and more evidence of inattention/hyperactivity. Moreover, the level of exposure was significantly and negatively correlated with fine motor ability and IQ performance (Birth Defects Res. A. Clin. Mol. Teratol. 2004;70:476-82). This study supported the hypothesis that occupational exposure to waste anesthetic gases during pregnancy might be a risk factor for minor neurological deficits in the offspring. Although more data are needed, women of reproductive potential working in surgical areas should consider decreasing or eliminating their exposure to anesthetic gases if pregnancy is a possibility. Moreover, postponing elective surgery until after pregnancy or, at least, after the period of organogenesis, also should be considered. Pregnancy tests should be conducted in any woman of reproductive potential before surgery.

Although the data are very limited, small amounts of some local anesthetics such as lidocaine are excreted into breast milk. Because the amounts in the maternal circulation are usually very low, any exposure of a nursing infant probably is clinically insignificant. Mothers exposed to general anesthetics will not be capable of nursing for several hours, thus allowing clearance of the agents from their circulation. ■

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Simulator Teaches Force Modulation for Shoulder Dystocia

BY M. ALEXANDER OTTO

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SEATTLE – Use of a birth force simulator taught clinicians better how to modulate how much force they use when handling a case of shoulder dystocia to avoid brachial plexus and other injuries.

The pull should be no more than 100 newtons (N), a gentle but firm traction, according to Dr. Jeanne-Marie Guise, an obstetrician and gynecologist at Oregon Health and Science University, Portland. It's hard to know, however, exactly how much that is. Shoulder dystocia occurs in only 0.2%-3.0% of births, so training opportunities are rare, and shoulder dystocia

VITALS

Major Finding: Following training on a birth simulator, the percentage of clinicians pulling with more than 150 N during simulated shoulder dystocia deliveries fell from 75% to 43%.

Data Source: A nonrandomized educational intervention involving 40 clinicians.

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emergencies are not very teachable moments. Dr. Guise and her colleagues wanted to see if training on a birth simulator would help clinicians get a feel for how much force to use.

Twenty-eight obstetricians, six family physicians, and six certified midwives, with experience ranging from 6 months to 34 years, were trained on a PROMPT birthing simulator

with force monitoring, made by Limbs & Things Ltd. (Bristol, England). Initially, they were blinded to the force-monitoring screen; 38 (95%) pulled with more than 100 N, 30 (75%) with more than 150 N, and 21 (53%) with more than 200 N. Greater force was used as time wore on.

Then, while watching the screen and then from memory, participants pulled with 50 N and

then 100 N several times, to get a feel for what those levels of force felt like. At 100 N, Dr. Guise told them, "this is the most you should ever feel, so pay attention" to what it feels like: "If you're starting to shake, how your facial muscles feel," and so on.

To see if the training took, participants went through surprise simulations. During their shifts, a nurse came running up saying, "I need a doctor, I need a doctor!" Trainees were pulled into a triage room, "but didn't exactly know why," Dr. Guise said. In the room, they faced the PROMPT simulator again, but this time with an actress playing the part of a frantic mother during a shoulder dystocia delivery. Participants couldn't see the

force-monitoring screen. "We plummeted the heart rate and tried to get everything as realistic as it could be. The actress was really acting it up," she said.

Even under pressure, training made a significant difference. Although 33 (82%) of the participants used more than 100 N, only 17 (43%) used more than 150 N, and 11 (28%) used more than 200 N. "There was a reduction in overall forces applied after simulation training. Participants were able to gauge forces applied after training," Dr. Guise and her colleagues concluded in the study abstract.

"It's nice to find a way to teach providers to modulate the amount of force in a moment that's not as critical," she said. ■