Date :

Title : GENERAL ANESTHESIA FOR CESAREAN SECTION: MATERNAL AND FETAL NOREPINEPHRINE LEVELS AND NEONATAL NEUROBEHAVIORAL STATUS

Authors : S. M. Shnider, M.D., T. Abboud, M.D., G. Levinson, M.D., R. G. Wright, M.D., S. Kim, M.D., E. Henriksen, M.D., S.C. Hughes, M.D., M.F. Roizen M.D, J. Johnson

Affiliation: Departments of Anesthesia, Obstetrics, Gynecology and Reproductive Sciences, University of California, San Francisco, 94143, and Department of Obstetrical Anesthesia, University of Southern California, Los Angeles, California 90033

Introduction. Nitrous oxide and oxygen with or without the addition of low-dose enflurane or halothane is used commonly in obstetric anesthesia for cesarean section. We assessed if the addition of a halogenated hydrocarbon for the brief period of time prior to delivery would reduce circulating plasma norepinephrine levels and have salutary effects on neonatal status. We were especially interested in emergency cesarean sections, during which fetal asphyxia is more likely.

Methods. We received informed consent and approval from the Committee on Human Research to study 153 patients scheduled for cesarean section under general anesthesia. Rapid induction of anesthesia and endotracheal intubation were performed in the usual way using thiopental and succinylcholine. Patients were then given one of four anesthetics until delivery: 1) nitrous oxide, 50 per cent, and oxygen (n = 52) alone; or with 2) 0.5 per cent halothane (n = 53), 3) 0.5 per cent enflurane (n = 25), or 4) 1 per cent enflurane (n = 23). Patients were grouped into the following obstetric categories: 1) elective repeat cesarean section (n = 69); 2) breech presentation (n = 41); 3) preeclampsia (n = 21); or 4) emergency cesarean section for a variety of obstetric problems, including failure to progress, cephalopelvic disproportion, amnionitis, and placenta previa (n = 22). Maternal blood samples for norepinephrine levels were drawn prior to induction, at the time of intubation, and at the time of delivery. These levels were correlated with maternal blood pressure and heart rate. Apgar scores and TSR were noted. The duration of anesthesia prepartum and the time of uterine incision to delivery were recorded. Umbilical cord gases and umbilical vein norepinephrine levels were measured. Pre- and postoperative hematocrit and estimated blood loss were compared. In addition, the Scanlon Early Neonatal Neurobehavioral Scale was performed at 2 and 24 hr of age. In the postoperative period, the mothers were questioned regarding recall of intraoperative events.

Results. After induction of anesthesia with thiopental-succinylcholine, at the time of endotracheal intubation, maternal plasma norepinephrine levels increased 21 per cent from control ($P < 0.05$). Among the four anesthetic groups, and among the four obstetric categories, maternal norepinephrine levels after intubation did not differ significantly from those occurring at the time of delivery. Fetal norepinephrine levels were significantly higher in the emergency cesarean section and preeclamptic groups when compared with the elective and breech groups. Regardless of the anesthetic, fetal norepinephrine levels were significantly higher in infants with low Apgar scores at birth. In all obstetric categories, maternal blood pressure and heart rate increased at the time of intubation and then promptly fell towards preoperative levels, regardless of the anesthetic used. The addition of a halogenated agent in the preeclamptic group did not produce a greater reduction in blood pressure than did nitrous oxide alone. In cesarean sections for breech deliveries, the halogenated agents did not appear to offer any advantage insofar as time from uterine incision to delivery, fetal acid-base status, or results on neurobehavioral exam at 2 and 24 hr. Similarly, in the emergency cesarean section group, no one anesthetic technique appeared to offer advantages to the neonate in regard to fetal acid-base status, clinical condition at birth, or neonatal neurobehavioral status. Nonetheless, a comparison of the four anesthetic regimens indicated that the addition of low-dose halothane or enflurane prevented maternal awareness of intraoperative events when compared with nitrous oxide alone (6 per cent).

Discussion. Low-dose halogenated agents for cesarean section did not produce the expected beneficial effects in preeclamptic patients, breech presentations, or other conditions requiring emergency cesarean section. In preeclamptic patients, nitrous oxide alone produced changes in maternal blood pressure that were similar to those produced by halogenated agents. In breech presentations, the halogenated agents did not appear to provide enough uterine relaxation to shorten the interval from uterine incision to delivery, or to improve neonatal status. Despite this lack of fetal benefits, we believe that low-dose halothane or enflurane should be added to nitrous oxide, 50 per cent, to prevent maternal awareness. These low doses of halogenated hydrocarbons are not associated with increased maternal blood loss.