

Title: EFFECTS OF EPIDURAL MORPHINE ON UTERINE BLOOD FLOW AND ACID-BASE STATUS IN THE PREGNANT EWE

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Introduction. Currently, a number of investigators are studying the effects and safety of epidural opiates in the human parturient. However, to date, there have been no studies of the effects of these drugs on uterine blood flow or maternal and fetal cardiovascular and acid-base statuses. We are currently studying this new anesthetic technique in a chronic maternal-fetal sheep preparation.

Methods. Surgery was performed under general anesthesia in nine pregnant ewes at 130 to 135 days gestation (normal gestation, 147-150 days). Polyvinyl catheters were inserted into both maternal femoral arteries, one maternal femoral vein, right carotid artery, right atrium, and both fetal femoral arteries. A catheter was placed in the amniotic fluid, and an electromagnetic flow probe placed on a main branch of the uterine artery supplying the pregnant horn. All catheters and the probe were exteriorized and secured, and the animals were allowed to recover for 24 to 48 hours.

During a 30-min control period, with the animal lying on her left side breathing supplemental oxygen through a face mask, we continuously measured maternal and fetal heart rate and blood pressure, maternal respiratory rate, and intra-amniotic and central venous pressures. At 0, 15, and 30 min, we measured maternal cardiac output using the cardiogreen method, and maternal and fetal arterial blood gases. The loss-of-resistance technique was used to enter the lumbar epidural space. A Teflon catheter was inserted and 20 mg of morphine in 20 ml of normal saline injected. Over the subsequent two-hour period, the same physiologic variables were measured as were measured during the control period. Following the two-hour study period, a dose of 8 ml of 2 per cent lidocaine was injected through the epidural catheter to confirm correct placement.

Results. Following injection of morphine into the epidural space, no significant changes occurred in uterine blood flow, intra-amniotic pressure, maternal ventilation, cardiac output, stroke volume, total peripheral resistance, or fetal well-being, as judged by arterial blood pressure, heart rate, and acid-base status (table).

Conclusions. Presuming the applicability of these data to humans, our results support the safety of epidural morphine analgesia for both the parturient and fetus

during labor.

Table 1. Cardiovascular and Acid-base Data (% Change from Control \pm SEM)

CARDIOVASCULAR DATA					
Time after Administration of Morphine (min)					
	15	30	60	90	120
MATERNAL:					
MABP	8.6 ± 4.0	10.4 ± 4.0	10.7 ± 2.3	14.0 ± 2.2	16.5 ± 3.4
Heart rate	7.3 ± 6.4	4.6 ± 5.3	4.9 ± 5.5	10.3 ± 5.3	9.7 ± 4.7
UBF	6.6 ± 5.7	-7.8 ± 3.0	5.5 ± 4.6	16.6 ± 4.4	18.2 ± 11.2
Cardiac output	-6.8 ± 5.2	-6.2 ± 6.1	-6.4 ± 5.8	-10.2 ± 6.6	-4.0 ± 3.3
Stroke volume	-14.0 ± 4.1	-10.9 ± 4.6	-11.5 ± 5.0	-20.6 ± 3.1	-14.8 ± 2.5
TPR	21.1 ± 6.7	23.2 ± 4.5	22.0 ± 4.6	29.2 ± 7.4	22.9 ± 5.2
FETAL:					
MABP	-0.5 ± 4.7	8.0 ± 6.6	5.7 ± 5.0	-0.5 ± 4.3	4.3 ± 2.5
Heart rate	4.7 ± 6.6	1.6 ± 3.9	-0.4 ± 4.7	-2.0 ± 4.5	7.6 ± 4.1
ACID-BASE DATA					
MATERNAL:					
PCO ₂	33.1 ± 2.6	34.9 ± 3.5	34.9 ± 3.8	35.1 ± 3.1	34.7 ± 3.4
FETAL:					
PCO ₂	46.0 ± 3.1	46.3 ± 3.0	45.2 ± 3.3	50.1 ± 5.4	49.1 ± 5.4
pH	7.34 ± 0.03	7.33 ± 0.03	7.33 ± 0.03	7.31 ± 0.03	7.32 ± 0.03
PO ₂	20.2 ± 1.7	21.0 ± 1.8	20.2 ± 1.7	18.6 ± 1.3	19.9 ± 1.5

MABP, mean arterial blood pressure; UBF, uterine blood flow; TPR, total peripheral resistance.