Title: INTRAVENOUS INJECTION OF BUPIVACAINE IN THE PREGNANT EWE

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Introduction: Bupivacaine is an amide local anesthetic that is frequently used with regional block in obstetrical anesthesia. When there is an inadvertent intravascular injection, maternal seizures and fetal distress may occur. The extent of the compromise, its cause and relation to a specific dose of bupivacaine remain unknown since major regional analgesia produces changes due to both the chemical sympathectomy and the direct effects of local analgesia. Biehl et al and Morishima et al have reported the effects in the pregnant ewe of the continuous infusion of non-convulsant and convulsant doses of lidocaine. To date, no one has reported on the effect of bolus intravenous injections of bupivacaine on maternal and fetal cardiovascular dynamics, catecholamines, uterine blood flow and fetal acid-base status.

Method: Eight pregnant ewes (gestational age: 124-138 days, term 145-150 days) underwent hysterotomy under halothane/N_2O/O_2 anesthesia. Cannulas were placed in a fetal femoral artery and vein, intrauterine cavity, both maternal femoral arteries and both maternal femoral veins. An electromagnetic flow probe was placed around a main uterine artery and a Swan-Ganz catheter was placed in the maternal jugular vein. The animals were allowed to recover from the preparatory surgery for at least 24 hours before an experiment was performed. Following a stable thirty minute control period, ten mg of bupivacaine was injected intravenously. Maternal, uterine and fetal vascular dynamics were monitored continuously, and at 1,3,5,15,30,45 and 60 minutes after injection, maternal and fetal arterial blood samples were obtained for acid-base, local anesthetic and catecholamine determinations. In a similar manner, 20 mg, 30 mg, and 40 mg of bupivacaine were injected.

Results:

A. Maternal: With a 10 mg dose, there was a significant rise (30%) in cardiac output and a significant fall (18%)in total peripheral resistance lasting ten minutes but the mean arterial pressure remained constant. With a 40 mg dose there was a significant (23%) rise in total peripheral resistance and a significant fall (18%) in cardiac output lasting ten minutes. There was a sustained rise (5%) in mean arterial pressure lasting thirty minutes.

B. Uterine artery: There was a dose dependent decrease in uterine artery blood flow ranging from 24% with a 10 mg dose to 47% with a 40 mg dose. The peak decrease was at 1 minute and returned to control values in 10 minutes.

C. Uterine tone: There was a dose dependent increase in uterine tone ranging from 23% with a 10mg dose to 60% with a 40 mg dose. The peak increase was at 1-3 minutes and returned to normal in 10 minutes.

D. Fetus: With increasing doses of bupivacaine, there was a progressively greater fall in PaO_2.

E. Catecholamines:

1.) Maternal - Although there was an increase in dopamine and norepinephrine levels with the 10 mg dose, there was a dose-dependent decrease with the higher doses lasting 10 minutes.

2.) Fetal - There was a dose-dependent increase in dopamine and norepinephrine lasting 15 minutes.

F. Bupivacaine levels: will be presented.

Discussion: The intravascular injection of a test dose (10 mg) of bupivacaine in the chronic maternal-fetal sheep preparation resulted in a transient increase in maternal cardiac output without affecting maternal or fetal acid-base status. The intravascular injection of a therapeutic dose (40 mg) of bupivacaine resulted in a sustained fetal hypoxemia resulting from decreased uterine blood flow, increased uterine tone and decreased maternal PaO_2. Fetal reserve was sufficient to prevent severe acidemia.

References:

1.) Biehl, D.; Shnider, S.M.; Levinson, G.; Callender, K.: "The Direct Effects of Circulating Lidocaine on Uterine Blood Flow and Foetal Well-Being in the Pregnant Ewe". Canadian Anaesthetists Society Journal, Vol. 24, No. 4, July 1977 p. 445-451.

2.) Morishima, H.O.; Gutsche, B.B.; Keenaghan, J.B.; et al: "The Effect of Lidocaine Induced Maternal Convulsion on the Fetal Lamb". Abstracts, Annual Meeting of the American Society of Anesthesiologists, 1977 p. 293-294.

	BUPIVACAINE I.V.	
SUMMARY	10 MG.	40 MG.
Maternal		
·AP	→	↑
·CO	↑↑	↓
·HR	↓	↓↓
·SV	↗	↓
·TPR	↓	↑↑
·Ut. Flow	↓	↓↓
·Am. P	↑	↑↑
ABG ·pH	→	→
·PCO_2	→	↗
·PO_2	↗	↓
Fetal		
·AP	↘	↑
·HR	→	↑↑
ABG ·pH	→	→
·PCO_2	→	↑
·PO_2	→	↓↓