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Title: MATERNAL AND FETAL CATECHOLAMINE RESPONSE TO KETAMINE

Authors: J.B. Craft, Jr., M.D., Son D. Dao, M.D., M. Lynn Yonekura, M.D., David A. MacKinnon, M.D., E.G. Co, M.D., Michael Roizen, M.D., Paul Mazel, Ph.D., Robin Gilman, M.S.E.E., Leslie Shokes, M.S.E.E.

Affiliations: Departments of Anesthesiology and Obstetrics/Gynecology, George Washington University Medical Center, Washington, D.C. 20037 and *Department of Anesthesiology, University of California School of Medicine, San Francisco, California 94143.

Introduction. Ketamine, a phencyclidine derivative which induces intense analgesia and amnesia, increases the arterial blood pressure. The mechanism by which ketamine increases arterial blood pressure is unclear, although there is some evidence of indicate that central stimulation with norepinephrine release is of major importance[1]. Greiss[2] has shown that drugs which cause an increase in maternal arterial pressure usually decrease uterine blood flow with subsequent fetal hypoxemia and acidosis due to vasoconstriction. Shnider[3], however has demonstrated that ketamine at a dosage of 5 mg/kg produces an increase in uterine blood flow rather than a decrease. To date, no one has reported on the effect of ketamine at a dose of 0.7 mg/kg on maternal and fetal catecholamine levels as well as their relationship to cardiovascular dynamics, 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, in a maternal femoral artery and vein and in the intra-uterine cavity. An electromagnetic flow probe was placed around a main uterine artery and a Swan-Ganz catheter was placed via the maternal jugular vein for the measurement of central venous pressure and cardiac output. The animals were allowed to recover from the preparatory surgery at least 24 hours before an experiment was performed. During the experiment, fetal blood pressure, heart rate, pulmonary arterial pressure, uterine blood flow and amniotic fluid pressure were measured continuously. Maternal cardiac output was measured using a thermodilution technique. Maternal and fetal acid-base status were monitored. Following a stable thirty minute control period, ketamine in a dosage of 0.7 mg/kg was injected intravenously. At 1,3,5,10,15,30,45 and 60 minutes after injection, maternal and fetal arterial blood samples were obtained for acid-base, ketamine and catecholamine determinations.

Results.

Maternal. The injection of ketamine resulted in an increase in mean arterial pressure (11%, $p<0.05$), an increase in heart rate (11%), an increase in cardiac output (16%) and a decrease in total peripheral resistance (6%) from control values. These changes began within one minute of the injection and lasted less than thirty minutes. There was a significant decrease (0.4%, $p<0.05$) in maternal pH due to a rise in the $PaCO_2$ (12%, $p<0.05$)

Uterine Artery. The uterine artery flow decreased 8% within one minute and then increased 8% ($p<0.05$) by five minutes. This increase lasted thirty minutes.

Uterine Tone. The uterine tone increased 41% ($p<0.01$) within three minutes and declined to normal values over a thirty minute period.

Fetus. The fetal systemic blood pressure increased 10% ($p<0.01$) by one minute and returned to control values within thirty minutes. The fetal arterial pH did not change, nor was there a change in the $PaCO_2$. There was a rise in the $Pa0_2$ ($p<0.05$) within five minutes which persisted beyond thirty minutes.

Catecholamines.

Maternal. The epinephrine values decreased 30% by three minutes and then increased to 20% above control values by forty-five minutes. The norepinephrine values decreased 20% by five minutes and increased to 20% above control values by forty-five minutes. The dopamine values then returned to control values by forty-five minutes.

Fetal. The epinephrine values increased 43% by five minutes and remained elevated for thirty minutes. The norepinephrine values decreased 20% by five minutes and returned to normal values by ten minutes. The dopamine values decreased 18% by fifteen minutes and returned to control values by thirty minutes.

Discussion. The intravenous infusion of ketamine (0.7 mg/kg) causes a rapid increase in maternal and fetal arterial pressure in association with an increase in uterine artery blood flow, a marked increase in uterine tone and a significant increase in fetal oxygenation. The maternal norepinephrine and epinephrine values are significantly decreased while the cardiovascular changes are occurring.

References.

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