Title: NITROGLYCERINE EFFECT IN THE HYPERTENSIVE PREGNANT EWE

Authors: J.B. Craft, Jr., M.D.; E.G. Co, M.D.; M.L. Yonekura, M.D.; R.M. Gilman, MSEE

Affiliation: Departments of Anesthesiology and Obstetrics and Gynecology
George Washington University Medical Center, Washington, D. C. 20037

Introduction: Nitroglycerine, a potent vasodilator of both arterial and venous vascular muscle has been of clinical use during the past century for the relief of angina pectoris and more recently in the treatment of myocardial infarction, congestive heart failure, valvular disease and myocardial dyssenergy. In a previous study, we measured the effect of nitroglycerine in the normotensive pregnant ewe and noted a decrease in cardiac output, mean arterial pressure, uterine blood flow and fetal arterial pH. To date, however, there have been no reports of the effect of an intravenous infusion of nitroglycerine in the hypertensive pregnant ewe on 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 and in the intra-uterine 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 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 every fifteen minutes using a thermodilution technique. Maternal and fetal acid-base status was measured every fifteen minutes. Following a stable 30 minute control period, phenylephrine was infused to increase the mean arterial pressure twenty percent and decrease uterine blood flow thirty-five percent. After thirty minutes, while continuing the infusion of phenylephrine at the same rate, nitroglycerine was infused at a rate sufficient to restore the blood pressure to control values. When the blood pressure was stable, sampling was begun, and the nitroglycerine infusion continued for 30 minutes. The phenylephrine infusion was continued for 30 minutes after the nitroglycerine was discontinued and sampling was continued. There was a 30 minute control period after the phenylephrine was discontinued.

Results:

Maternal: The infusion of neosynephrine resulted in a statistically significant increase ($p<0.05$) in total peripheral resistance (60%), mean arterial pressure (20%), and a statistically significant decrease ($p<0.05$) in heart rate (30%) and cardiac output (25%) from control values. The infusion of nitroglycerine restored these parameters toward their control values. There was a significant decrease ($p<0.05$) in maternal PaO_2 during the nitroglycerine infusion.

Uterine artery: The uterine artery flow decreased to 50% of control values ($p<0.05$) with the infusion of phenylephrine. When the nitroglycerine was begun, there was a statistically significant ($p<0.05$) increase to 70% of control.

Fetus: The fetal heart rate decreased and blood pressure increased during the infusion of phenylephrine but returned to normal values with the infusion of nitroglycerine. There was a marked drop in fetal pH (7.37 to 7.30) ($p<0.05$) during the phenylephrine infusion but there was a statistically significant increase (7.30 to 7.35) during the nitroglycerine infusion.

Discussion: The intravenous infusion of neosynephrine causes a rapid sustained increase in blood pressure with an associated reduction in uterine blood flow, cardiac output and an increase in total peripheral resistance. This closely mimics the cardiovascular alteration present in patients with gestational hypertension. In this model, infusion of nitroglycerine was rapidly effective in partially relieving the uterine artery spasm and increasing the uterine artery blood flow and fetal arterial pH. Thus nitroglycerine may have a place in the acute management of gestational hypertension.

References:

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