Abstract

Pregnancy is the unique, short reproductive event with far reaching consequences for the individual, family and society. The placenta is the primary fetal organ of respiration, metabolism, nutrition and excretion. The early detection of placental dysfunction is critical for the fetal and maternal survival. Additionally the placenta is a highly vascular organ and has been used as a model for brain research and vascular responses. The structure and function of the placenta differs between male and female fetuses, which makes it a perfect model to study gender-dependent vascular responses. There are indeed obvious gender differences in vascular responsiveness and vascular metabolism, which has been identified in other vascular beds. The technique of placental perfusion in vitro provides a unique opportunity to evaluate the physiological responses to the vascular active substances and estimate the feto-maternal drug transfer.

Objectives

The objective is to establish the model of perfusion of human placenta in vitro and to record indirectly placental vessel contractility.

Materials and Methods

After obtaining the informed consent, placenta was received after non-complicated cesarean section delivery, the fetal artery was immediately cannulated, followed by the cannulation of fetal vein (Figure A). The cannulation and flushing re-established the circulation in one of the intact cotyledons (Figure B) at which time it is placed into the perfusion chamber (Figure B). The re-established circulation is open circle fetal circulation (Figure 2). A basal fetal arterial hydrostatic pressure (FAHP) was recorded (Figure 3). After baseline is established, 3M KCl is added to induce vasoconstriction pressure is recorded using Lab Chart software (ADInstruments, U.S., Colorado Springs, Colorado). In addition to recording FAHP we also measure and record: temperature, pH, oxygen tension using Lab Chart. We also used the FLIR infrared technology to examine temperature of the sample which also provides indication that the placenta is still metabolically active.

Results

The mean FAHP was 35.3±5 mmHg, mean weight of the cotyledons was 44.0±4 g. The temperature in the perfused cotyledon was constant throughout the experiment.

Conclusions

- We were able to establish placental perfusion in vitro in our laboratory, the only placental perfusion lab in West Texas.
- Our data is in line with those published by Dr. Brownbill.
- We were able to establish a baseline FAHP and subsequently induce vasoconstriction using 3M KCl. Induction of vasoconstriction shows that the placenta is viable and metabolically active.
- Placenta perfusion is an excellent tool for the study feto-gender specific responses.

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