

# T400-Series Surgical Protocol

## Fetal Sheep Pulmonary Artery: Chronic Blood Flow Measurement

### APPLICATION BASICS

Site:	Pulmonary artery
Species:	Fetal Sheep
Stage of Gestation:	110 days
Duration:	Chronic, 30 days
Vessel Diameter:	6 mm

### PROBE

Size:	6 mm (back exit)
Reflector:	L with sliding cover
Connector:	10-pin
Cable Length:	60 cm
Catalog #:	MC-6PSB-LS-WC60-CRA10-GC

### FLOWMETER

TS420 Perivascular Module

### Application

Blood flow in the pulmonary artery is used extensively in pregnancy research. Some investigators use blood flow in combination with pressure to measure changes in vascular resistance induced by pharmaceutical agents. Others look for diurnal patterns associated with parturition.

### Surgical Approach

Read reference by Rudolph et al., it contains a complete description of this and other fetal surgeries. Premedicate with 0.4 g glycopyrrolate IM, induce with 1 g ketamine IM and maintain anesthesia on 1.5% - 2% halothane.

Place anesthetized sheep in dorsal recumbency and make a ventral paramedian incision from the umbilicus to a point 2 cm cranial to the udder. The skin incision is made 1 cm off midline to avoid the median subcutaneous vein. Retract the skin and associated vascular structures and continue the incision through midline of the abdominal wall. Identify and exteriorize the umbilical horn containing the fetus. Palpate the fetus to identify the orientation and to locate the head and forelimbs.

Make a transverse incision in the uterus to allow access to the surgical site over the left upper thorax. Once the fetus is exposed pull the forelimb cranially and incise the skin and brachial muscles over the third intercostal space. Carefully place a small hemostat around each adjacent rib and pass a #1 silk suture around each rib. These sutures can be used to lift the ribs so that the intercostal muscles and parietal pleura may be incised without damaging the underlying

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### Flow Ranges Observed

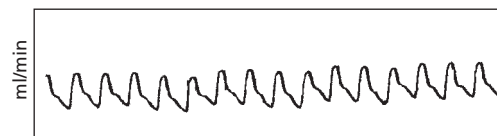


Fig. 1: Fetal sheep: 110 day gestation. Mean blood flow in the left pulmonary artery was 10 ml/min.

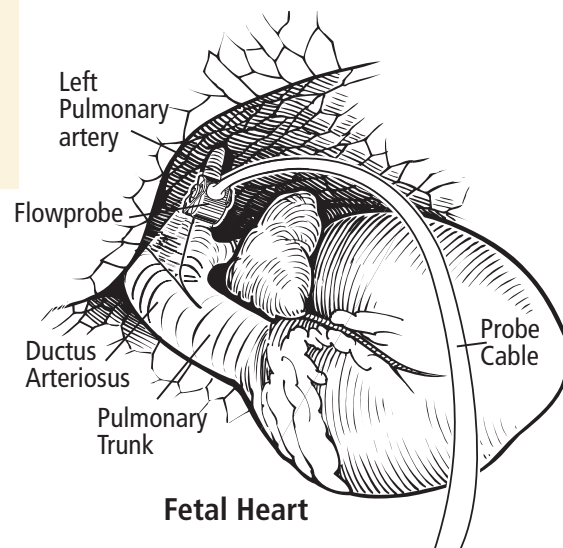


Fig. 2: Schematic of Probe placement on fetal heart.

## Fetal Sheep Pulmonary Artery: Chronic Blood Flow Measurement Cont.

### Surgical Approach cont.

lung or heart. An infant size Finochietto rib-spreader may be used for retraction. Lift the pericardium, incise it from the pulmonary valve to the vagal nerve, place a #4-0 silk suture in the cranial edge of the pericardium and retract it. Using blunt dissection, carefully establish a plane of dissection between the ductus arteriosus and the pulmonary artery; it may be necessary to cauterize small vessels in this area. Pass dissecting forceps behind the left pulmonary artery and pass two segments of 0.050" OD polyvinyl tubing around it.

Lift the left pulmonary artery with tubing segments and pass the reflector bracket of the Probe under the artery. Close and secure the slide and suture the Probe to adjacent tissue. Install a chest drainage tube and pass the cable out one end of the incision. Appose the ribs with a #1 silk suture. Close the muscle and the fetal skin in separate layers with 2-0 simple continuous sutures. Secure the Probe cable to fetal skin with a 2-0 simple interrupted suture. Close the uterus with a continuous Cushing pattern oversewn with a continuous Lembert, the Probe cable is exteriorized through this incision. Extend the Lembert pattern slightly to oversee the cable for 2 cm. Use a trocar to puncture the abdominal wall in the paralumbar fossa. Enlarge the incision by scalpel to allow passage of Probe connector. Close the body wall and skin routinely. Suture the cable to the skin of the ewe near the exit site.



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### ACKNOWLEDGEMENT

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### REFERENCES

Rudolph AM, Heymann MA 1980. Methods for studying the circulation of the fetus in utero. In: Monographs in Fetal Physiology: Animal Models in Fetal Medicine (I). Nathanielsz, P.W., editor. Pub. Perinatology Press, Ithaca, NY. pp. 1-58.

Tiktinsky MH, Morin III, FC, "Increasing Oxygen Tension Dilates Fetal Pulmonary Circulation via Endothelium-Derived Relaxing Factor," Am J Physiol 1993; 265: H376-H380.

Iwamoto, J., Morin III, F.C., "Nitric Oxide Inhibition Varies with Hemoglobin Saturation," J Applied Physiol 1993; 75(5), 2332-2336.

Wong J, Fineman JR, Heyman MA, "The Role of Endothelin and Endothelin Receptor Subtypes in Regulation of Fetal Pulmonary Vascular Tone," Pediatric Research 1994; 35(6): 664-670.

Shiraishi H, Silverman NH, Rudolph AM, "Accuracy of Right Ventricular Output Estimated by Doppler Echocardiography in the Sheep Fetus," Am J Obstet & Gynecol 1993; 168: 947-953.

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