T400-Series Surgical Protocol

Sheep Simultaneous Coronary Flow & NMR Spectroscopy: Acute Blood Flow Measurement

**APPLICATION BASICS**
- **Site:** Coronary sinus shunt
- **Species:** Sheep: 5 - 90 days old
- **Weight:** 5 - 14 kg
- **Duration:** Acute
- **SENSOR**
  - **Size:** 3 mm (Inline)
  - **Cable Length:** 1 meter
  - **Extension Cable:** 4 meter
  - **Catalog #:** ME-3PXN (non-magnetic)
- **FLOWMETER**
  - **TS410 Tubing Module**

**Flow Ranges Observed**

![Flow Ranges Observed](image)

**Application**

This protocol was developed to correlate the traditional technique of measuring oxygen consumption (ie, the product of concentration and flow) with ATP utilization as measured with NMR spectroscopy. The simultaneous measurement of blood flow with NMR presents some unique challenges. First, the Flowsensor must be completely constructed from non-magnetic materials. Special care must also be taken to minimize the noise introduced into the NMR signal by the flow system. In this protocol, both spatial isolation and electrical filtering were used to increase the signal-to-noise ratio. Finally, the signal-to-noise ratio is increased by gating data acquisition to the initial inspiratory phase of the respiratory cycle and summing 60 acquisitions. In two animals, this concept was taken even further and the heart was paced at a precise harmonic of the ventilation rate.

**Surgical Approach**

Induce anesthesia with ketamine (10 mg/kg IM) and xylazine (0.2 mg/kg IM). Intubate and ventilate with oxygen and halothane at a rate of 30 cycles per minute. Perform a left thoracotomy with rib removal to expose the left ventricle.

Identify the leftazygous vein draining into the coronary sinus, and ligate it as shown in Fig. 3 to keep it from contributing to apparent coronary flow. Make a shallow skin incision over each jugular vein and catheterize each vein with 1/8 inch Tygon tubing. Advance one catheter into the right atrium and the other into the coronary sinus as shown in Fig. 4. Place a suture around the coronary sinus so that all coronary drainage must pass through the catheter.

Connect one of the jugular catheters to the cannulating Flowsensor. Connect a plastic T connector to other end of the

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Surgical Approach cont.
Flow sensor and the other jugular catheter to other port of the T connector as shown in Fig. 5. The stem of the T connector can be used for blood sampling or heparin flushing of the shunt.

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REFERENCES