

T400-Series Surgical Protocol

Pig Superior Mesenteric Artery: Acute Blood Flow Measurement

APPLICATION BASICS

Site:	Superior mesenteric artery
Species:	Pig
Weight:	15 - 25 kg
Duration:	Acute
Vessel Diameter:	3 mm

PROBE

Size:	4 mm (back exit)
Reflector:	L with sliding cover
Connector:	10-pin
Cable Length:	60 cm
Catalog #:	MC-4PSB-LS-WC60-CRA10-GA

FLOWMETER

TS420 Perivascular Module

Application

This protocol was developed in studies of the hemodynamic basis for gastric stress ulceration secondary to cardiogenic shock. Cardiogenic shock was induced with mild hemorrhage and cardiac tamponade. Cardiac output was then measured and maintained at a given fraction of baseline by varying the severity of the cardiac tamponade. This model produces reproducible and stable levels of cardiogenic shock with severe splanchnic vasoconstriction and gastric lesions strikingly similar to those seen in patients with "stress ulceration".

Pigs with alpha adrenergic blockade were compared to pigs with ablated renin-angiotensin axis; alpha adrenergic ablation failed to significantly alter the characteristic response while blockade of the renin-angiotensin axis substantially ameliorated both the celiac bed ischemia and vasospasm. While moderate gastric vasoconstriction during shock favors survival, hyper-responsiveness causes ischemia that exacerbates the process, terminating in a positive feedback cycle that is inevitably fatal. Researchers concluded that this syndrome might be treated or prevented with pharmacological blockade of the renin-angiotensin axis.

Surgical Approach

Induce anaesthesia with acepromazine (0.5 mg/kg IM) and ketamine (5 mg/kg IM). Mechanically ventilate via a tracheostomy and maintain anaesthesia with repeated bolus injections of pentobarbital (5 mg/kg). Administer maintenance fluids (lactated Ringers 15 ml/kg/hr) via a femoral catheter and maintain body temperature at 38-39°C with a radiant heat lamp and thermal blanket.

Place anesthetized pig in right lateral recumbency and make a 4 cm vertical skin incision just caudal to the last rib. Extend the skin incision through the cutaneous, latissimus

(Continued on next side.)

Flow Ranges Observed

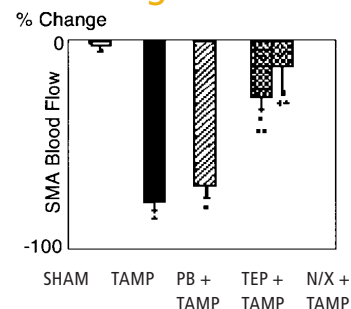


Fig. 1: Response of superior mesenteric arterial blood flow to cardiac tamponade.

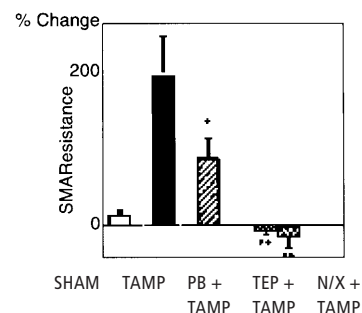


Fig. 2: Response of superior mesenteric resistance to maximum cardiac tamponade.

Pig Superior Mesenteric Artery: Acute Blood Flow Measurement Cont.

Surgical Approach cont.

dorsi, external abdominal oblique, internal abdominal oblique and transverse abdominal muscles. Care is taken not to incise the peritoneum. Trace the aorta cranially to identify and dissect free the root of the superior mesenteric artery. Taking care not to disturb the perivascular sheath, remove fatty tissue and pass the L bracket of the Probe around the superior mesenteric artery. Close the slide and secure the screw. If there is sufficient connective tissue, the Probe may also be sutured in position.

Remove the plunger of a 30 cc syringe and load the syringe with sterile acoustic gel, taking care to prevent the formation of air bubbles. Place a flexible catheter on the tip of the syringe; the catheter may be inserted into the Probe's acoustic window adjacent to the vessel and the gel deposited as the syringe is withdrawn.

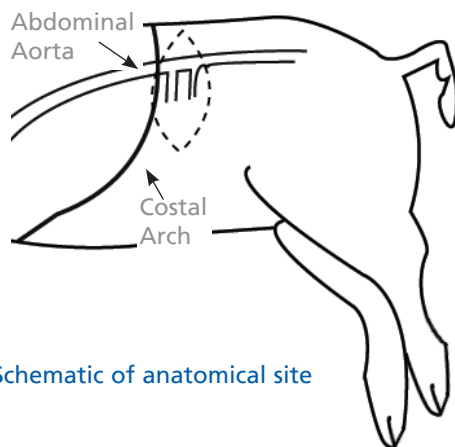


Fig. 3: Schematic of anatomical site

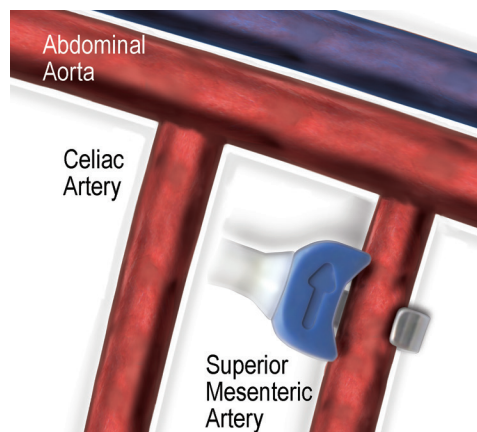


Fig. 4: Flowprobe placement

ACKNOWLEDGEMENT

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REFERENCE

Bailey RW, Bulkley GB, Hamilton SR, Morris JB, Haglund UH, "Protection of the Small Intestine from Nonocclusive Mesenteric Ischemic Injury Due to Cardiogenic Shock," Am J of Surg 1987; 153: 108-116.



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