T400-Series Surgical Protocol

Rat Mesenteric Branches: Acute Blood Flow Measurement

APPLICATION BASICS

Site:	Mesenteric branches: jejenal & ileal arcades
Species:	Rat
Body Weight:	400 grams
Duration:	Acute
Vessel Diameter:	270 µm

PROBE

Size:	0.5 mm
Reflector:	J
Connector:	CRA10: 10-pin
Cable Length:	60 cm
Catalog #:	MA-0.5PSB

FLOWMETER	TS420 Perivascular Module

Flow Ranges Observed

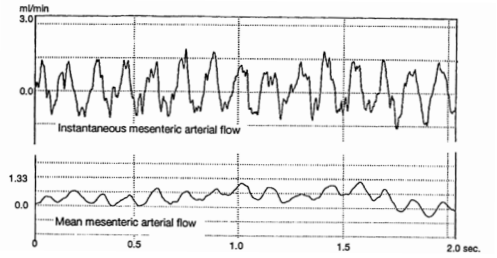

Fig. 1: Mean flow over 90 seconds was 0.494 ± 0.276 and 0.527 ± 0.233 ml/min, respectively. After treatment with isoprenaline and superfusion of the preparations with papaverine, mean flow increased to 0.666 ± 0.379 ml/min.

Application

The combination of this model and the new microcirculation transit-time Probe, allowed us to make the first measurements of true flows in the microcirculation. These were until now estimated from diameters and velocity measurements; this method lacked precision and prevented any appreciation of the instantaneous dynamic of flow. This allowed us to examine the instantaneous dynamic and to observe the cyclic variation of flow caused by the periodic contractions of the bowel.

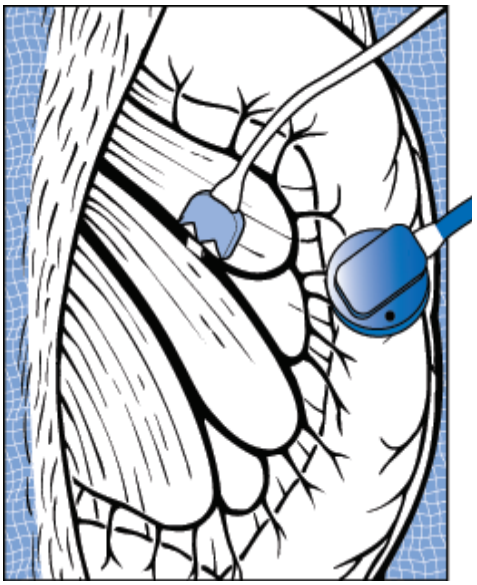

Fig. 2: Transit-time ultrasound Flowprobe on mesenteric (jejunal) branch (center); Laser Doppler Probe on mucosa on the right.

Surgical Approach

Note: This protocol is for mesenteric branches, jujunal and ileal arcades. The superior mesenteric artery (0.7 - 0.9 mm diameter) is larger than the branches and requires 1 mm Probes for full ultrasonic illumination.

Male Sprague-Dawley rats weighing approximately 400 gm were anesthetized with 0.1 ml / 100 gm pentobarital (6%) i.p. Anesthesia was maintained by additional i.p. injections of diluted pentobarital. The right jugular vein was cannulated with polyethylene tubing for the administration of drugs.

After a small abdominal incision, a section of the ileum was pulled out and spread over the transparent stage. Fat and connective tissues surrounding the mesenteric arteries (internal artery diameters were approximately 270 µm) were carefully removed under a dissecting microscope.

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Surgical Approach cont.

The preparation was mounted under a biological binocular microscope (Leitz) connected to a color video recording system. The surface of the mesenteric artery was covered with a Saran film. Warm Krebs' solution was superfused on the artery at a rate of 2 ml/min. The microscope magnification was 145 fold. The stainless steel handle of the Probe was connected to a micromanipulator in order to allow positioning of the Probe around the vessel near the objective. The vessel was positioned in the lumen of the Probe, making sure the reflector bracket was not tugging on the vessel wall to reduce the flow. Zero flow reading was obtained by transient clamping of the arteriole under investigation.

Basal flow measurements were done at a few minute intervals, the mean flows over 90 seconds were 0.494 ± 0.276 ml/min and 0.527 ± 0.233 ml/min respectively. The reproducibility seems excellent despite the elevated standard deviation due to the physiological periodic reduction of flow provoked by intestinal peristalsis.

After treatment of the animals with isoprenaline and superfusion of the preparations with papaverine, the mean measured flow increased to 0.666 ± 0.379 ml/min.

REFERENCES

Marque S et al, "APC Inhibits FMLP Induced Leukocytes Sticking in the Micro-circulation," FASEB J 1993; 7(3.1)1: A344.

Superior Mesenteric Blood Flow

Myers SI et al, "Oxygen Free Radicals Regulate Splanchnic Nitric Oxide Synthesis and Blood Flow," Cardiovascular Surgery 1995; 3(2): 207-10.

Wang J F et al, "The Roles of Nitric Oxide and Hydrogen Peroxide Production in Lipopolysaccharide-Induced Intestinal Damage," Shock 1995; 2(3): 185-191.

Turnage R H et al, "Neutrophil Regulation of Splanchnic Blood Flow after Hemorrhagic Shock," Ann Surg 1995; 222(1) 66-72. 575A)

Pofahl, W.F. et al, "Small Intestinal Microcirculatory Effects of Octreotide," J Surg Res 1994; 56:345-350. (397A)

Kost C K et al, "Vascular Reactivity to Angiotensin II is Selectively Enhanced in the Kidneys of Spontaneously Hypertensive Rats," J Pharmacol & Expe Therap 1994; 269(1) 82-8. (426A)

Jackson EK, Herzer WA, "Angiotensin II/Prostoglandin I2 Interactions in Spontaneously Hypertensive Rats," Hypertension 1993, 22: 688-98. (344A)

Turnage RH et al, "Splanchnic PG12 Release and "No Reflow" Following Intestinal Perfusion," J Surg Res 1995; 222(1): 66-72.

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