

T400-Series Surgical Protocol

Rat Femoral Artery: Chronic Blood Flow Measurement

APPLICATION BASICS

Site:	Femoral artery
Species:	Rat
Body Weight:	150 - 400 grams
Duration:	Chronic
Vessel Diameter:	0.7 - 0.9 mm

PROBE

Size:	1 mm
Reflector:	JS
Connector:	4-pin
Cable Orientation:	Side or Back
Cable Length:	14 cm (12 - 16 cm typical)
Catalog #:	MC-1PR(B or S)-JS-WC14-CM4S-GC

FLOWMETER	TS420 Perivascular Module
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Application

The femoral artery provides an easily accessible site for measurement of peripheral or hindlimb blood flow, and requires only superficial surgery for the implantation of the Flowprobe. Anesthesia and the prone posture of the rat during surgery both markedly decrease femoral artery flow. Thus, chronic implantation of the Flowprobe is necessary in order to fully assess the effects of posture, immobilization or vasoactive agents on peripheral blood flow.

Surgical Approach

Rats are anesthetized with an intramuscular injection of a 1:1 mixture of ketamine hydrochloride (Ketaset, 100mg/ml) and xylazine hydrochloride (Rompun, 20mg/ml) at a dose of 0.1ml/100g body weight. Surgery is performed under nominally aseptic conditions. The Probe and all surgical instruments are chemically sterilized by immersion in Cetyl chloride (benzalkonium chloride and cetyl dimethyl ethyl ammonium bromide) for at least 15 min. To maintain body temperature during surgery, the rat is placed over an isothermal pad. A 1 cm, dorsal incision is made in the mid-scapular region skin. A ventral incision is made at the junction of the right thigh and the body wall. A blunt hemostat is used to create a subcutaneous tunnel from the mid-scapular to the leg incision. The connector is covered with a bullet-shaped cap, and a loop of 4-0 silk suture is tied to its end. A blunt hemostat is then passed through the subcutaneous tunnel from the mid-scapular

Flow Ranges Observed

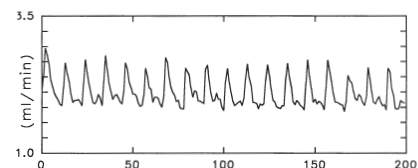


Fig. 1. Right Femoral Artery of 125 g Wistar-Furth rat, normal ambulatory posture. Flow rates observed under anesthesia, with the rat in the prone position, are considerably less than those observed in the ambulatory rat. Ambulatory femoral artery flow rates vary over the cardiac cycle from 0.5 to as much as 9 ml/min in young rats (120-200 g). Mean flow rates are generally in the range of 1.5 to 4 ml/min.

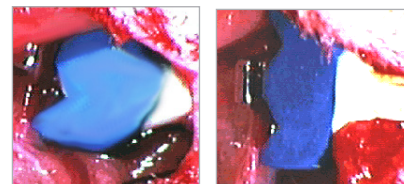


Fig. 2

Fig. 3

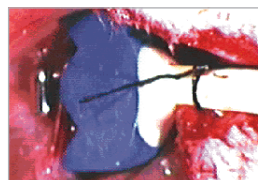


Fig. 4

REFERENCES

Roer RD, RM Dillaman, "Effect of simulated weightlessness on femoral artery blood flow in the rat," *The Physiologist* 1991; 34: 235.

Roer RD, RM Dillaman, "Effect of simulated weightlessness on femoral artery blood flow in the rat," *J Appl Physiol* 1994; 76(5): 2125-2129.

Rat Femoral Artery: Chronic Blood Flow Measurement Cont.

Surgical Approach cont.

to the leg incision. The hemostat is used to grasp the suture on the bullet-shaped cap of the connector and the Flowprobe connector and cable are passed via the subcutaneous tunnel from the leg region to the mid-scapular incision.

The right femoral artery is exposed and separated from the femoral vein and saphenous nerve by blunt dissection of the fascia with two pairs of fine, vascular forceps. The perivascular "J" reflector of the Flowprobe is then slipped below and around the femoral artery in the region just distal to the rectus abdominis muscle, with the reflector oriented toward the anterior (Fig. 2). The Probe is then sutured with two 6-0 braided silk sutures to the underlying musculature (gracilis anterior) such that the cable is directed toward the posterior (Fig. 3). One loop is placed immediately adjacent to the transducer, and the second is placed approximately 0.5 cm away. A subcutaneous pocket is created by blunt dissection posterior to the Probe, overlying the gracilis posterior muscle. A loop of the Probe cable is inserted into this pocket to allow for movement of the limb without putting tension on the femoral artery (Fig. 4).

The cavity containing the Probe is filled with Surgilube gel to provide acoustic coupling to the Probe. After the Probe is tested for the presence of a good acoustic signal, the ventral incision is sutured closed and the connector is sutured to the skin of the mid-scapular region (5-0 or 4-0 monofilament nylon). Both incisions are then swabbed with topical antiseptic (Betadine).

We modified the Flowmeter cable by the insertion of an electronic swivel (Braintree Scientific). By clamping the swivel to a ring stand above the cage, the animal is allowed free movement with 360° rotation. While the implant is chronic, we make our measurements periodically, detaching the cable from the mid-scapular connector and capping the connector between measurements. We have maintained the Flowprobes within rats for periods up to three weeks, but see no reason why this period could not be extended. Generally, after one or two weeks, the skin in the mid-scapular region rejects the sutures, so rats must be anesthetized for the connector to be reattached.



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