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Method Article

Microsurgical technique for femoral vascular access in the rat

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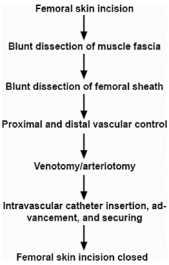
GRAPHICAL ABSTRACT



ABSTRACT

Vascular access is used experimentally for a variety of reasons. In our lab, we achieve arterial access to record arterial pressure and venous access to administer fluids and drugs. We present a microsurgical atlas of our technique for femoral arterial and venous access in the rat.

ARTICLE INFO

Keywords: Catheterization, Vascular access, Femoral, Rat, Operative

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Method details

Femoral arterial and venous access permits recording of arterial pressure and administration of fluids/drugs, respectively, in experimental animal models. In our lab, arterial pressure is used for general physiological monitoring, as well as a dependent variable during experimental interventions, including asphyxia, hypoxia, and hypercapnia, as well as procedures, including decerebration and

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spinal cord hemisection and transection [1–4]. Venous access allows us to administer fluids and drugs, such as vecuronium, in unanesthetized decerebrate animals. Our technique is presented in descriptive and illustrative detail [1–6].

Methods

All procedures were approved by the Drexel University Institutional Animal Care and Use Committee, which oversees Drexel University's AAALAC International-accredited animal program. Two catheter systems, one each for the femoral vein and artery, were prepared prior to experiments. The catheter system is composed of the catheter tubing itself – PE50 cut at a length of approximately 20 cm with the tip cut at a 45° angle with a razor blade. The PE50 tubing is secured over a needle attached to a three-way stopcock, with the two other ports attached to fluid-filled syringes. For the arterial system, one of these is a 1 ml syringe filled with 300 U/L of heparin in Ringer-Locke solution. The remaining are 5 ml syringes filled with normal saline, Ringer-Locke, or artificial CSF. The arterial catheter system is filled with heparin and the venous catheter system with non-heparinized solution. The stopcock is locked in the direction of the catheter tubing.

Ten spontaneously-breathing, Sprague-Dawley adult male rats (340–380 g) were anesthetized with isoflurane vaporized in O_2 (Matrix; 4–5% induction, 1.85–2.15% maintenance) via a snout mask. The electrocardiogram (EKG) was measured via three small subcutaneous electrodes using conventional amplification and filtering (Neurolog; Digitimer, Hertfordshire, UK) and monitored using an audio amplifier (model AM10; Grass Instruments) and oscilloscope. Anesthetic depth was maintained at a level such that withdrawal reflexes and changes in heart rate in response to pinches of the distal hind limbs were absent.

A skin incision is made in the femoral region parallel to the femoral sheath (Fig. 1). Soft tissue is dissected to expose the femoral neurovascular bundle (Figs. 2 and 3). The femoral sheath is opened using blunt dissection directed along its long axis between the femoral artery laterally and vein medially. This exposes the femoral vessels, which are further separated with blunt dissection in the same manner. Medial retraction of the femoral vein reveals the vena profunda femoris (Fig. 4); proximal control should be distal to this branch to avoid retrograde bleeding via this vessel through the subsequent venotomy site. Distal ligation is obtained using 4-0 braided silk suture and a needle holder (or hemostat) is placed on the suture thread ends, approximately 3 cm from the knot and allowed to rest on the edge of the operating table. The operating table sits on the lab bench and the needle holder rests on the operating table and is supported by the lab bench, forming an approximately 30° angle with the horizontal plane. The weight of the needle holder applies an idealdegree of tension to the vessel to facilitate introduction of the catheter subsequently. This is a subtle

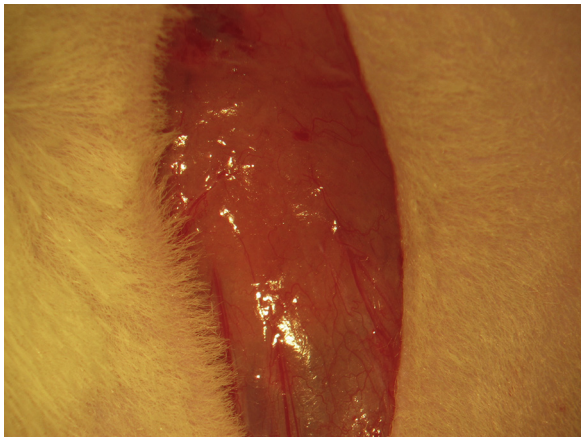

Fig. 1. A femoral incision is made parallel to the femoral sheath.