THE MICROVASCULATURE OF THE BRAIN OF THE STERLET, *ACIPENSER RUTHENUS L.* A SCANNING ELECTRON MICROSCOPE (SEM) STUDY OF VASCULAR CORROSION CASTS

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Introduction

The brain cannot store oxygen and glucose and thus depends on a continuous blood supply via the cerebral circulation. While the neuroanatomy of the vertebrate brain is well documented [1] its angioarchitecture is studied to a much lesser extent. Existing knowledge on the brain microvascularization is mainly derived from India-ink injected, cleared and sectioned brains and a few SEM studies of microvascular corrosion casts [for a bibliography see 2]. In bony fish the vascularization of the pineal gland [3] and in cartilaginous fish those of the rhombencephalic choroid plexus [4] and the hypothalamo-hypophyseal area [5] only are studied by the later technique. The aim of the present study is to describe gross arterial supply, venous drainage and the capillary bed of the ganoid brain.

Materials and Methods

Vascular corrosion casts of eleven brains of the sterlet, *Acipenser ruthenus L* (total lengths: 10-46 cm) were studied by scanning electron microscopy (SEM). Briefly, fish were heparinized by an intraperitoneal injection of 5000 I.E heparin and anesthetized after 10 minutes by immersion in MS 222 (0.5%; Sandoz, Basle, Switzerland). Animals then were decapitated, the lower jaw was removed by a horizontal section at the midlevel of the gills and a glass cannula was introduced via the first efferent branchial artery into the ipsilateral internal carotid which arises from the rostral portion of the lateral dorsal aorta. After fixing the cannula by a fine ligature and after tieing off the contralateral dorsal aorta between first und second afferent gill arteries the circulatory system of the brain was rinsed with Amphibian Ringer solution and 5 ml Mercox-Cl-2B diluted with monomeric methylmethacrylate (4+1; v+v) were injected manually. After hardening of the injected resin specimens were processed as described elsewhere [2].

Results and Discussion

Inspection of casts with low magnification revealed great individual variations in course, dimension and appearance of cerebral vessels, especially in olfactory arteries and basilar prosencephalic arteries (Figs. 1, 2). In contrary to former reports [6] a single branch of the dorsal mesencephalic artery, which we named „central cerebellar artery“ was found to supply the central portion of the cerebellum. Some individuals had two arterial circles at the base of the brain, some one (Figs. 3,4) or even no arterial circle. The very small calibre of the anastomoses connecting posterior cerebral arteries (Fig. 3) might have been overlooked in light microscopical studies. SEM of microvascular corrosion casts clearly allows to demonstrate even smallest anastomoses. The venous drainage was found to be by the unpaired main choroidal vein, the course of which can vary greatly, and by paired middle and posterior cerebral veins, which had a rather constant course.

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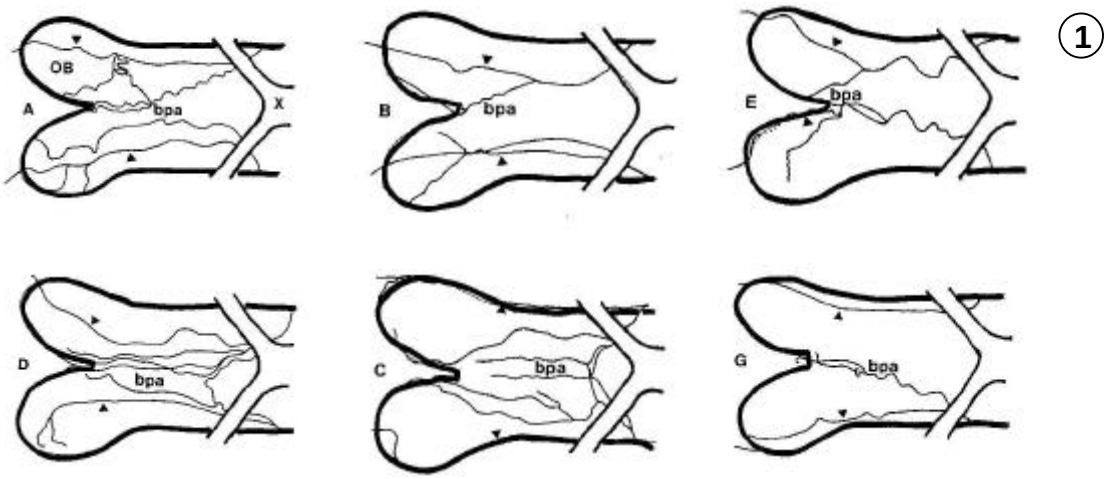

FIG. 1: Six variations of the course of the olfactory arteries (solid triangle) and the basilar prosencephalic arteries (bpa) as seen in vascular corrosion casts. OB olfactory bulb, X optic chiasma. Rostral is to the left.

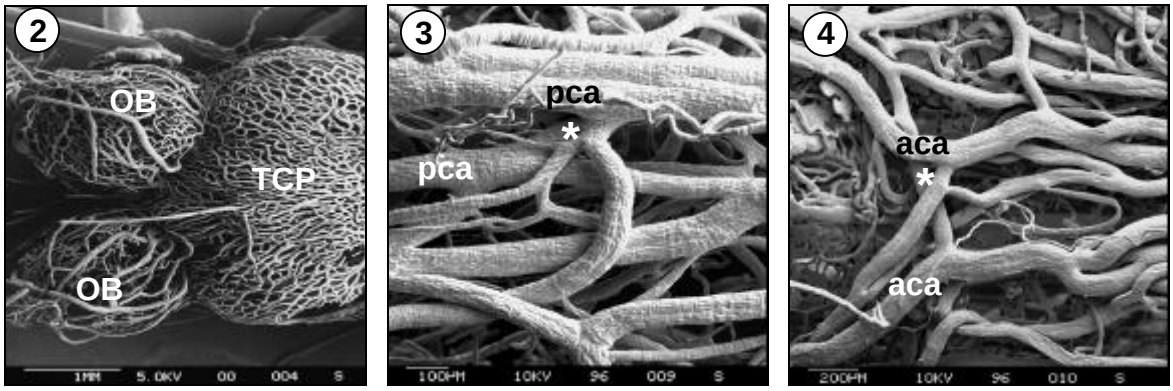

FIG. 2. Dorsal view at the olfactory bulbs (OB) and telencephalic choroid plexus (TCP).
FIG. 3. Anastomosis (*) between posterior cerebral arteries (pca) closing the posterior arterial circle of Willis.
FIG. 4. Anastomosis (*) between anterior cerebral arteries (aca) closing the anterior arterial circle of Willis.

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