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Morphology of the Otic Ganglion in Some *Arvicolidae*

MORFOLOGIA ZWOJU USZNEGO U NIEKTÓRYCH NORNIKOWATYCH *ARVICOLIDAE*

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Gienc J., Kosierkiewicz D. & Szczurkowski A., 1989: Morphology of the otic ganglion in some *Arvicolidae*. Acta theriol. 34, 43: 656—659 [With Plate VII — VIII]

Research demonstrated that the otic ganglion in the pine vole *(Pitymys subterraneus)* and bank vole (*Clethrionomys glareolus)* is a single aggregation of neurocytes 0.6 mm long. In the pine vole it is most closely connected with the maxillary artery, whereas in the bank vole it lies on the medial surface of the mandibular nerve.

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1. INTRODUCTION

The details of the structure of the otic ganglion in rodents can be seen in spite of their small size by using the thiocholine method which makes it possible to observe the minute and delicate cholinergic structure (Gienc, 1977). This technique made it possible to examine the structure of the otic ganglion in five rodent species from three families: *Muridae, Cricetidae* and *Cavidae* (Gienc & Kuder, 1980; Kuder, 1983, 1985). Observations on *Cricetidae* indicate a relation between the morphology and topography of the otic ganglion, and the systematic position of the examined animal (Kuder, 1983b, 1985). Such a suggestion requires, however, confirmation on more extensive material. Therefore, research was undertaken on the structure of this ganglion in some *Arvicolidae*.

2. MATERIAL AND METHODS

Research was done on 30 pine voles *Pitymys subterraneus* (de Selys-Longchamps, 1836) and 30 bank voles *Clethrionomys glareolus* (Schreber, 1780) of both sexes bred at the laboratory of the Mammals Research Institute of the Polish Academy of Sciences in Białowieża. The animals were anaesthetised with ether. Before starting histochemical analyses in ten animals of each species synthetic latex LBS-3060 was injected into the head arteries (Godynicki, 1971). Then the mandibular nerve was exposed and the maxillary artery from the medal side. Further procedures followed the thiocholine method of Koelle-Friedenwald (1949), adapted by Gienc (1976, 1977) for examination of macromorphological preparations. Under a binocular microscope the otic ganglion, stained histochemically *in situ,* was separated from the connective tissue and sealed together with the mandibular nerve and maxillary artery in a polyvinylpyrrolidone solution for further microscopic examination. Further details of the procedure are given in earlier publications (Gienc, 1976,1977).

3. RESULTS

In the pine vole the otic ganglion was closely connected with the maxillary artery where it intersected with the mandibular nerve on the medial side. The neurocytes forming the ganglion encompassed this vessel from the upper medial and lower sides close to the posterior edge of the mandibular nerve (Plate VII, Figs 1, 2). In most cases the main mass of the ganglion was localised on the upper surface of the maxillary artery. This meant that there was a direct contact of the ganglionic neurocytes with the median surface of the mandibular nerve (Plate VII, Fig. 3). Only in a few cases the main mass of the ganglion lay on the lower surface of the above mentioned vessels (Plate VII, Fig. 4).

The otic ganglion of the pine vole was irregular in shape and varied from one animal to another. It formed a kind of open circle surrounding the maxillary artery on three sides on a segment 0.58—0.64 mm long (Plate VII, Figs 3, 4). Numerous intensively staining bundles of ganglionic fibres run from the ganglion. The thickest ones emerging from the anterior pole of the ganglion formed a distinct plexus on the maxillary artery wall. The remaining bundles penetrated to the mandibular nerve and auriculotemporal nerve.

In the bank vole the otic ganglion may be situated in two places. It usually lies at the intersection of the maxillary artery with the posterior edge of the mandibular nerve (Plate VIII, Figs 5, 6, 7). In several cases it lay close to the anterior edge of this nerve (Fig. 8). The anterior part of the ganglion lies in the vicinity of the median pterygoid nerve running obliquely backwards (Plate VIII, Figs 5, 6, 7).

The shape of the otic ganglion varied in the bank vole. Usually it was elongated and its posterior pole was greatly thickened. It was reached in a characteristic way by the lesser petrosal nerve (Fig. 7). The anterior pole was greatly narrowed and passed in two profusely branched bundles of ganglionic fibres (Figs 5, 7). The upper bundle connected with the mandibular nerve, whereas the lower bundle running along the medial maxillary artery wall, joined the branchings of the mandibular nerve. In a few cases the ganglion was oval or irregular (Figs 6, 8). The ganglion in the examined bank voles was 0.54-0.62 mm long.

4. DISCUSSION

The otic ganglion in mammals can be topographically connected either with the mandibular nerve or the maxillary artery (Gienc & Kuder, 1985). This depends on the course of the artery in relation to the nerve. In mammals in which the maxillary artery lies sideways to the mandibular nerve, the otic ganglion is always localised on its medial surface (Čirkova, 1958,1959; Godinho, 1968; Kovšikova, 1958; Petela, 1974, 1979). In the other representatives of this phylum as, for instance rodents, the maxillary artery intersects with the mandibular nerve on the medial side, and the otic ganglion usually connects with the latter and not with the nerve (Fischbach & Dudzińska, 1970; Gienc & Kuder, 1980; Kuder, 1980; 1983a, 1983b, 1985).

In the rodents studied so far (Kuder, 1980, 1983a, 1983b, 1985) this ganglion is connected with the maxillary artery. In *Pitymys subterraneus* as in *Cricetus auratus* and *Meriones meridianus* the neurocytes of the ganglion surround the artery in the form a circle or semicircle. Gienc (1969, 1971) found that a taxonomic close relationship is also expressed in details of the anatomical structure. This is fully confirmed by the similar morphology and topography of the otic ganglion in the bank vole, the hamster and the midday gerbil. It can be explained by their relationship since the family *Arvicolidae* is derived from *Cricetidae* (Kowalski, 1971).

Kuder (1985) suggests that the parasympathetic ganglia exhibit traits characteristic for such taxons as species, family and order. The results of the present research fully confirm this opinion, since in the second examined representative of *Arvicolidae,* the bank vole, the position of the otic ganglion and the maxillary artery to one another resembles that in *Muridae* than *Cricetidae* (Kuder, 1983b, 1985). It may, however, be assumed that certain anatomical and topographic traits result undoubtedly from the taxonomic position. This is also confirmed by observations of the otic ganglion and the pterygopalatine one in the guinea pig (Gienc & Kuder, 1980; 1982; Gienc, 1984). The different topography of these structures in this species may be attributed to its appurtenance to a different rodent suborder.

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EXPLANATION OF PLATES VII—VIII

Plate VII

Fig. 1. Otic ganglion in the pine vole *Pitymys subterraneus*, scheme of morpho-topographical relation.

Fig. 2. Right medial side. Thiocholine method. Magn. × 50.

Fig. 3. Right medial side. Maxillary artery filled with latex. Thiocholine method. Magn. × 40.

Fig. 4. Left medial side. Maxillary artery filled with latex. Thiocholine method. Magn. × 35.

Plate VIII

Fig. 5. Otic ganglion in the bank vole *Clethrionomys glareolus*, scheme of morpho-topographical relation.

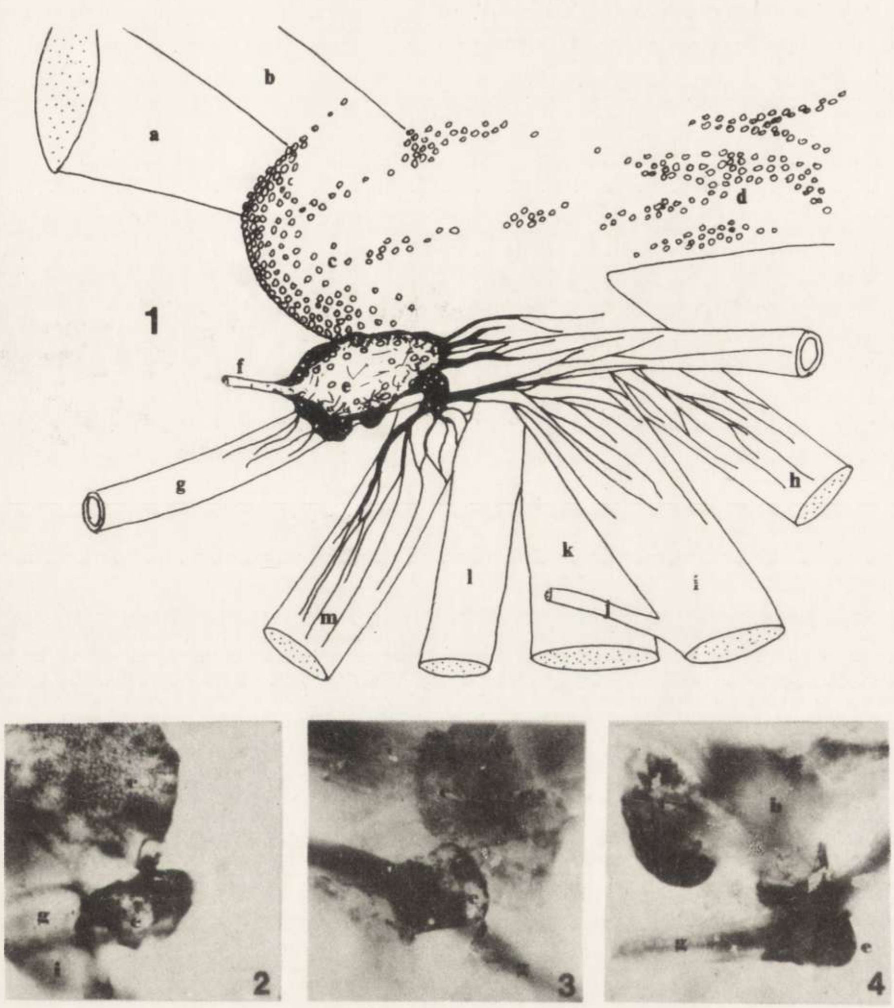
Fig. 6. Left medial side. Thiocholine method. Magn. × 45.

Fig. 7. Left medial side. Thiocholine method. Magn. × 60.

Fig. 8. Left medial side. Atypical localization of the ganglion. Thiocholine method. Magn. × 50.

ABBREVIATIONS

a — sensory root, **b** — motor root, **c** — aggregation of neurocytes corresponding to the mandibular nerve, **d** — aggregation of neurocytes corresponding to the mmaxillary nerve, **e** — otic ganglion, **f** — lesser petrosal nerve, **g** — maxillary artery, **h** — buccal nerve, **i** — lingual nerve, **j** — tympanic chorda, **k** — alveolar mandibular nerve, **l** — mylohyoid nerve, **m** — auriculotemporal nerve, **n** — pterygoid medial nerve.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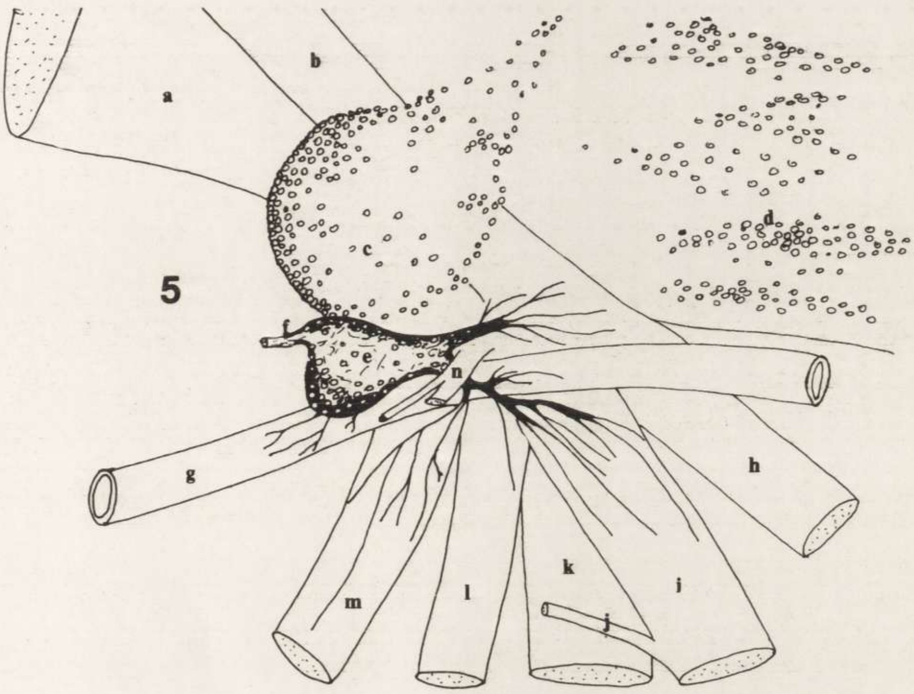
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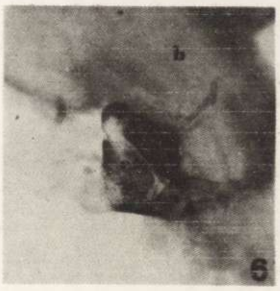
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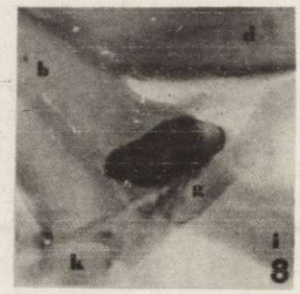
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