Folia Morphol.
Vol. 60, No. 1, pp. 61–64

ISSN 0015–5659
www.fm.viamedica.pl

VIA MEDICA

ORIGINAL ARTICLE

Morphology, topography and cytoarchitectonics of the otic ganglion in Egyptian spiny mouse (*Acomys cahirinus,* Desmarest)

Aleksander Szczurkowski, Tadeusz Kuder, Elżbieta Nowak, Jacek Kuchinka

Department of Comparative Anatomy, Institute of Biology, Świętokrzyski University, Kielce, Poland

[Received 27 December 2000; Accepted 12 January 2001]

Using the thiocholine method of Koelle and Friedenwald and histological techniques, the otic ganglion in Egyptian spiny mouse (Acomys cahirinus, Desmarest) was studied. The ganglion was found to be a single oval cluster of neurocytes, situated at the medial and posterior surface of the mandibular nerve just above the maxillary artery. The ganglion is composed of typical ganglionic neurons in compact arrangement without a thick connective-tissue capsule.

key words: parasympathetic ganglia, otic ganglion, Egyptian spiny mouse

INTRODUCTION

Observations on some families of rodents indicate certain relations between the morphological features and topography of the parasympathetic head ganglia and the taxonomic position of animal species. The present study relates to the family of rodents — *Muridae*, whose parasympathetic head ganglia have not so far been investigated. We hope that our results will be important comparative data for investigations of the autonomic nerve system of vertebrates.

MATERIAL AND METHODS

The reported investigations were carried out on twenty adult Egyptian spiny mice (*Acomys cahirinus,* Desmarest) of both sexes. The animals were killed by decapitation under ether anaesthesia. Before histochemical analyses in eight animals, synthetic latex LBS — 3060 was injected into the head arteries [11]. Then the mandibular nerve and maxillary artery were exposed. Further procedures followed the thiocholine method [12] adapted for macromorphological investigations [4]. From the remaining animals tissue was taken for routine histological techniques H & E.

RESULTS

The otic ganglion in Egyptian spiny mouse is a single, oval cluster of neurocytes, 0.8 mm long and 0.4 mm wide. It is situated at the medial and posterior surface of the mandibular nerve (Fig. 1A, B). The maxillary artery obliquely crosses the mandibular nerve on its medial side just below the otic ganglion. Direct contact between these two structures was observed (Fig. 1A, B). As demonstrated by the histochemical technique, the delicate postganglionic fascicles enter into connections with the branches of the mandibular nerve. Moreover cholinergic fibres at the surface of the maxillary artery were observed. The great activity of acetylcholine-esterase is characteristic for the satellite cells, and it allows for observation of the shape and topography of the whole investigated structure (Fig. 1A, B).

Histological investigations showed that the otic ganglion is a compact cluster of cells, which is closely connected with the mandibular nerve (Fig. 2). The ganglionic cells, usually about 35 μm in diameter, have a large clear nucleus with a well-outlined dark nucleolus. In cross-sections of this ganglion the neurocytes are not uniformly spread throughout the

Address for correspondence: Aleksander Szczurkowski, MD, Department of Comparative Anatomy, Institute of Biology, Świętokrzyski University, ul. Świętokrzyska 15, 25–406 Kielce, Poland, e-mail: aszcz@pu.kielce.pl

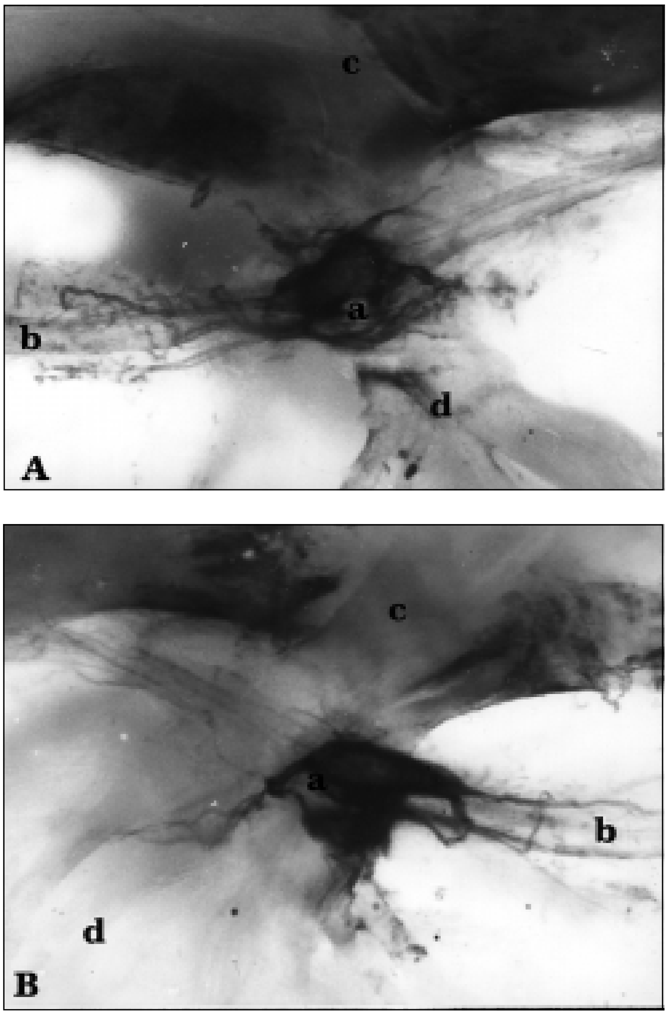

Figure 1. Otic ganglion in Egyptian spiny mouse. Thiocholine method. Magn. about 25 ×. A) left side; B) right side; a — otic ganglion; b — maxillary artery; c — trigeminal nerve; d — mandibular nerve.

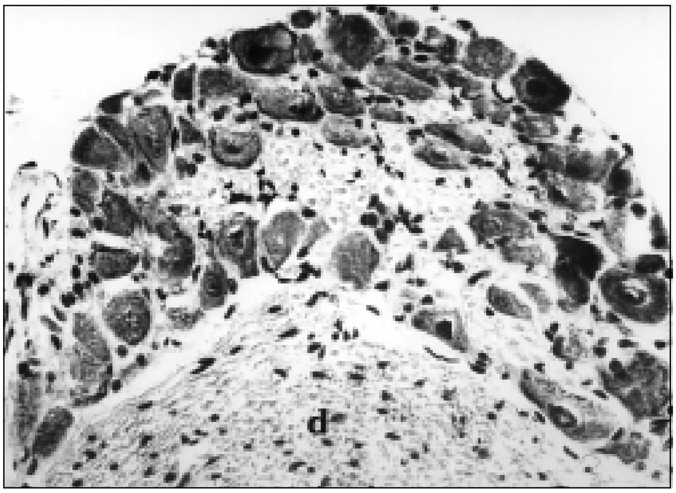

Figure 2. Cross-section through the otic ganglion in Egyptian spiny mouse. H & E metod. Magn. about 250 ×; d — mandibular nerve.

whole surface. The centre of the ganglion is filled by nerve fibres. Cell nuclei of the satellite cells around the neurocytes were visible (Fig. 2). A characteristic feature of the investigated structure was the lack of a connective tissue capsule surrounding the ganglion. This explains the high activity of acetylcholinesterase during the histochemical investigations.

DISCUSSION

A comparative analysis of the otic ganglion topography indicates in many species of mammals that the location of this structure depends on the position of the maxillary artery in relation to the mandibular nerve [7]. If the artery is situated laterally in relation to the mandibular nerve, the ganglion can only be connected with the mandibular nerve [1,2,10,13,19,20]. Whereas in most small mammals the maxillary artery runs along the medial side of the mandibular nerve [3,6,8,9,15–18,21] and the otic ganglion can be associated both with the mandibular nerve and with the maxillary artery at the site where it crosses the mandibular nerve. In many cases, the maxillary artery separates the main mass of the ganglion from the mandibular nerve. The agglomeration of nerve cells may surround the artery to form a circle or semicircle. Details of the anatomical structure are expected to be used in taxonomy. This is fully confirmed by the similar morphology and topography of the otic ganglion in the bank vole, hamster, midday gerbil and spotted suslik [9,16–18,21]. The best example of this taxonomical relationship is the derivation of the family *Arvicolidae* from *Cricetidae* [14]. In some species of mammals the position of the otic ganglion can be different from the others. In the hedgehog, the maxillary artery crosses the mandibular nerve on its medial side in such a way that the main mass of the ganglion is situated below this artery on the medial side of the mandibular nerve [8]. The numerous fascicles of the postganglionic fibres leave the ganglion at its upper border and surround the maxillary artery. The otic ganglion in spotted suslik is situated at the medial surface of the mandibular nerve but above the maxillary artery, and there is no direct contact between these two structures. The otic ganglion in Egyptian spiny mouse is situated at the medial side of the mandibular nerve just over the maxillary artery but direct contact between these two structures was observed. The otic ganglion may also form several cell clusters interconnected with each other, which can be situated both on the maxillary artery and the mandibular nerve, as observed in the wild pig [20], sheep, goat [1,2] and dog [5].

The comparative studies presented here suggest that the parasympathetic ganglia might be used as additional features for differentiating taxonomic categories such as species, families and orders [18].

REFERENCES

1. Ćirkova VP (1958) Nekotoryje dannyje o sekrecji okoloušnoj slunnoj železy ovec i koz. Tr VI Vsesojuznogo Sjezda Anat. Gist I Embriol, Kijev, 2: 115–119.
2. Ćirkova VP (1959) Innervacja slunnych želez ovec i koz. Diss Avtoref Novoćerk Zoovet Inst, Novoćerkassk, 1–20.
3. Fischbach I, Dudzińska B (1970) Topografia zwoju usznego u królika. Folia Morphol, (Warsz) 29: 241––247.
4. Gienc J (1977) The application of histochemical methods in the anatomical studies on the parasympathetic ganglia and nerve bundles of postganglionic axons in the sublingual region of some mammals. Zool Pol, 26: 187–192.
5. Gienc J, Kuder T (1980) Morphology and topography of the otic ganglion in guinea pig, detected with thiocholine technique. Folia Morphol, (Warsz) 39: 79–85.
6. Gienc J, Kuder T (1983) The otic ganglion of the dog: topography and macroscopic structure. Folia Morphol, (Warsz) 42: 31–40.
7. Gienc J, Kuder T (1985) Relations between maxillary artery and the otic ganglion. Folia Morphol, (Warsz) 44: 212–215.
8. Gienc J, Kuder T, Szczurkowski A (1988) Parasympathetic ganglia in the head of western hedgehog (Erinaceus europaeus). I Otic ganglion. Acta Theriol, 33, 10: 115–120.
9. Gienc J, Kosierkiewicz D, Szczurkowski A (1989) Morphology of the otic ganglion in some *Arvicolidae*. Acta Theriol, 34, 43: 656–659.
10. Godinho HP (1968) A comparative anatomical study of cranial nerves in goat, sheep and bovine (*Capra hirus*, *Ovis aries* and *Bos taurus*), their distribution and autonomic components. Iowa State University Ames — Iowa, pp. 130–372.
11. Godynicki S (1971) Zastosowanie lateksu LBS 3060 w preparatyce anatomicznej. Folia Morphol, (Warsz) 30: 601–603.
12. Koelle GB, Friedenwald JS (1949) A histochemical method for localising of cholinesterase activity. Proc Soc Exp Biol Med, 70: 617–622.
13. Kovšikova LP (1958) Ušnoj uzel-gnl. oticum — domašnich životnych. Ućennyje Zap Viteb Vet Inst, 16: 111–114.
14. Kowalski K (1971) Ssaki — Zarys teriologii. PWN, Kraków.
15. Kuder T (1980) Przywspółczulne komponenty nerwu trójdzielnego myszy. Streszcz Ref XII Zjazdu PTA, Kraków, 80–81.
16. Kuder T (1983a) Przywspółczulne zwoje głowowe, topograficznie związane z nerwem trójdzielnym u szczura i chomika. Streszcz Ref XIII Zjazdu PTA, Poznań, 69–70.
17. Kuder T (1983b) Comparative morphology and topography of cranial parasympathetic ganglia connected

with the trigeminal nerve in mouse, rat and hamster (*Mus musculus* L 1759, *Rattus norvegicus* B 1769, *Mesocricetus aureatus* W 1839). I Otic ganglion. Folia Morphol, (Warsz) 42: 187–197.
18. Kuder T (1985) Topography and macroscopic structure of parasympathetic ganglia connected with the trigeminal nerve in midday gerbil (*Meriones meridianus — Mammalia: Rodentia*). Acta Biol Cracov, Zool, 27: 61–71.
19. Petela L (1974) Topografia nerwu trójdzielnego u bydła. Część III: Nerw żuchwowy. Pol Arch Wet, 17: 559–580.
20. Petela L (1979) Nerw trójdzielny u dzika (*Sus scrofa* L 1758). Zesz Nauk AR, Wrocław, 17: 1–55.
21. Szczurkowski A (1999) Morphology, topography and cytoarchitectonics of the otic ganglion in the spotted suslik (*Spermophilus suslicus*, Gûldenstaedt 1770). Ann Anat, 181: 409–411.