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NEURONS FROM THE BASOLATERAL NUCLEUS AND THE OTHER NUCLEI OF THE BASOLATERAL GROUP OF THE AMYGDALOID COMPLEX IN THE RATS

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One of the basic problems in neuroanatomy is the establishment of the exact localization and determination of the morphological and functional characteristics of the different parts of the central nervous system (CNS). Although the position of the amygdaloid complex (AC) is clearly defined, so far, in the literature a unique attitude and a full unique opinion still has not been achived in terms of its division into types and cells, relations and functions. The heterogenicity of the AC in terms of the structure and the influence of relations with the orher parts of the CNS, is a wide field of studyng this complex brain structure.

Key words: amygdaloid complex, basolateral nucleus, types of neurons, rats

INTRODUCTION

The basolateral nucleus (BLN) belongs to the basolateral nuclei group of the amygdaloid complex (AC) which consists of several subcortical nuclei wich are active participans in the regulation of numerous autonomic and endocrine functions, as well as in the functions of the behaviour of the people and animals (4). The basolateral nucleus has relations with many important regions of the brain, including the temporal, the frontal and the insular cortex, then the subiculum, the thalamus, the hypothalamus, and it also has relations with the monoaminergic nuclei of the brainstem (2,5). In the inner part of BLN, the fine differences in the diameter of the cells, determine its cytoarchitectonic division in an anterior and posterior part. (5,7,8). The more recent researches have shown that certain populations of neurons of the anterior and the posterior BLN and neurons of the basolateral group, contain numerous neuropeptides (13). Knowing and studyng the cellular types of the basolateral nuclei group and the basolateral nucleus, is an important moment for understanding the way in which this structure connects and accomplishes its functions and the specific direct and indirect contacts with the mentiones brain regions.

MATERIAL AND METHODS

The morphology of the neurons of the anterior and posterior part of the NBL has been analysed on ten adult rats of both, males and females according to the Golgy method, which was modified according to Drekic and Malobabic (3). Anaesthetised with ether narcosis, the animals were sacrificed on the 62nd day of their life and the isolated region of

the amygdaloid complex was fixed in 10% neutral pufferated formaldehyde and then fixed in a 2% solution of K-bichromate. After the standard histological conduction of the material (dehydration in the series of alcohol, enlightenment with xylol and moulding into paraffin), the preparations are cut serially with thickness of 90-120 mm. The average diameter of the body of the neuron (mm) is determined with the help of ocular micrometer.

RESULTS AND DISCUSSION

The morphology and topography of the BLN with a combination of histological and histochemical methods has been studied by many authors (1.5.9.14). The characteristic of this nucleus is that in it there are the biggest and the most intensive coloured neurons in the framework of AC, which are easily separated from the neurons of the other nuclei that closely surround it (nucleus basomedialis, nucleus centralis and massa intercalata). Our earlier researches showed that in the inner part of the BLN, on the basis of the shape of the structure which is formed by intensive coloured and densely grouped neurons, two parts can be clearly recognised: an anterior (oval shape) and posterior part which is with more an irregular, elongated form. Both parts of the BLN change their configuration into rostrocaudal direction. Although the neurons of the BLN are largest neuron formation of AC within the BLN itself, we noticed a difference in size and intensity of colouring, as well as a difference in quantity of the neurons in the anterior and posterior pats. In the present work, with analysis of the preparations impregnated with the modified Golgy method, on the basis of the dendritic morphology, we noticed two dominant type of neurons that have a body with a pyramidal (especially in the anterior parts of the BLN) and pear-shape whose dendrites have plenty of numerous spines (Figure 1.2.).

The size of the cell bodies varies according to which part of the BLN they belong to. Most perikarya in the anterior part are 19-22mm long and 13-16mm wide, whereas in the posterior part, the values of these parameters are smaller and the length of the neuron bodies is 15-17mm and the width is 13-16mm. The neurons of the NBL from the first type of our Golgy preparations have most often 4-5 i.e. 6 primary dendrites (with thick cover of spines) of which one (apical) inconsiderably stronger than the others. The axons of the neurons from the first type are considerably thinner than the dendrites which befit them and they appear either from the neuron body itself (more seldom) or considerably more often from the proximate part of some of the primary dendrites. Pyramidal and pear-shapes neurons are also noticed in the other nuclei in the inner part of the basolateral position of the AC. This type of cells according to the description, and approximately according to the size of the neurons body, befits the projection neurons i.e. the class I which is described by McDonald (10,11), or according to the type S by Hall (6) in the adult rats and cats. Physiologically, the calls that belong to this grouping of neurons are according to the authors (12,13) exitative projection neurons (because they use exitative aminoacids as neurotransmitters) and have long axons with numerous collaterals.

The other type of neurons which we noticed in the inner part of the BLN, are presented with less numerous, smaller bipolar and multipolar neurons which are poor in spines and most frequently they have an oval shape of the body (Figure 4). They are perceived both in the anterior and posterior parts of the BLN, dispersed among the basic large pyramidal and pear-shaped neurons. The size of the neuron bodies from the second type varies a lot, and for the longer diameter of the neuron body it is from 9-14mm within the

radius. The population of the multipolar neurons is more numerous in the anterior part, whereas in the posterior part of BLN prevail neurons with a bipolar orientation of the primary dendrites. This type of cells according to the description, befits the neurons of class II (10,11) or the type P (6), and physiologically, the so-called non projection GABA-ergic inhibitory interneurons (12,13). With this research we confirm the similarity of the cytoarchitecture of the brain region from the basolateral nuclei group of rats with the cytoarchitecture of the same region of the opossum and the other mammals described by other authors.

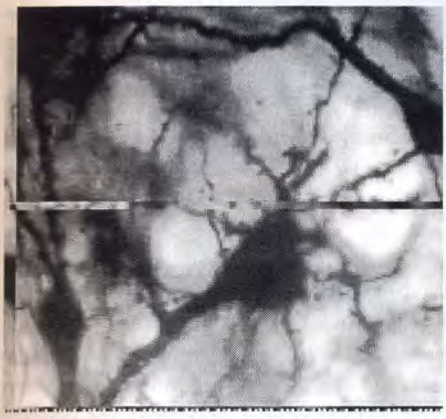

Figure 1: Basolateral nucleus, pars anterior, first type of neurons with pyramidal shape of body. Goldzy method, 1035 x

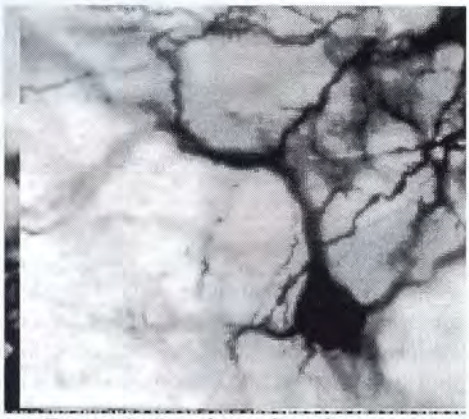

Figure 2: Basolateral nucleus, pars posterior, first type of neurons with pyramidal shape of body. Goldzy method, 1035 x

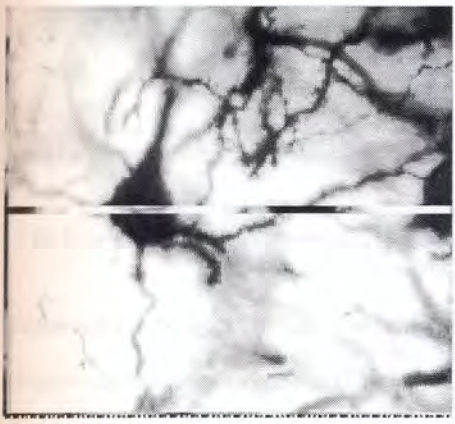

Figure 3: Lateral nucleus, first type of neurons, Goldzy method, 1035 x

Figure 4: Basolateral nucleus, pars anterior, second type of neurons. Goldzy method, 1035 x

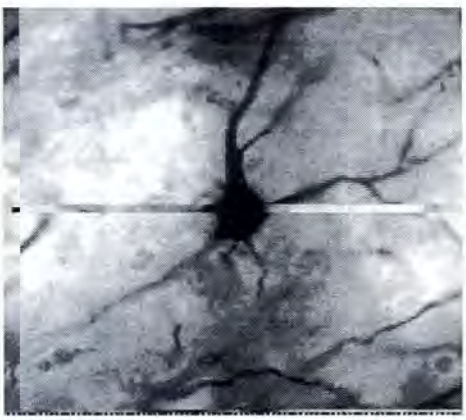

Figure 5: Neuron from basomedial nucleus. Goldzy method, 1035 x

CONCLUSION

With the modified Golgy method, the neurons morphology has been researched in the basolateral group of the amygdaloid complex, especially, neurons in the anterior and the posterior basolateral nuclei parts, in mature rats brain. Analysis of these neurons showed two dominant cell types which are perceived in basolateral, and in the other nuclei of the amygdaloid complex: in the basomedial and lateral nucleus, primarily. The first type of neurons are numerous, very large neurons with a pyramidal and pear-shape of the body with numerous spines, whereas the other type is representing with smaller bipolar and multipolar neurons which are poor in spines and most frequently they are with an oval shape of the cell body.

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НЕВРОНИ ОД БАЗОЛАТЕРАЛНИОТ НУКЛЕУС И ДРУГИТЕ НУКЛЕУСИ НА БАЗОЛАТЕРАЛНАТА ЈАДРЕНА ГРУПА НА АМИГДАЛОИДНИОТ КОМПЛЕКС КАЈ ТАВОРЦИ

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Денес еден од основните проблеми во невроанатомијата представув утврдувањето на точната локација и одредување на морфолошките и функционалните карактеристики на различните делови на ЦНС-от. Иако е положбата на амигдалоидниот комплекс (АК) јасно дефинирана до сега во литературата сеуште не е постигнат единствен став и полно единствено мислење во погледот на неговата поделеност на типови на клетки, врски и функции. Хетерогеноста на АК во погледот на структурата и богатството на врски со другите делови на ЦНС-от, представува широко поле за изучување на оваа сложена мозочна структура.

Клучни зборови: *амигдалоиден комплекс, базолатерален нуклеус, типови на неврони, ставорци.*