Small Neurons of Trigeminal Ganglion - Immunohisto Chemical Study

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Abstract

The cell bodies of pseudo unipolar neurons of the trigeminal ganglion have been presumed to play a supportive role to neuritis which transmit various sensations like pain from the periphery to the brain stem. However, several studies have recently shown that these neuronal cell bodies could modulate the afferent stimuli by up regulating various ion channels and also by increases the synthesis of neuropeptides like calcium gene-regulated peptides. The small sized neurons were identified by Immunohisto chemical localization in the trigeminal ganglion neurons.

Keywords: *Pseudo unipolar neurons, Trigeminalganglion,Immunohistochemistry.*

Introduction

Trigeminal ganglion a ganglion on the sensory root of the fifth cranial nerve situated in a cleft with in the dura matter on the anterior surface of the pars petrosa of the temporal bone. The trigeminal ganglion is chiefly formed by cell bodies of pseudounipolar neurons and nerve fibres. The cell bodies which predominantly occupy the peripheral part of the ganglion all surrounded by satellite cells while the nerve fibres are surrounded by Schwann cells.[1] The single neurite arising from each cell body divides into central and peripheral processes which transmits sensations like touch and pain from the head and face to the trigeminal nuclei in the brain stem. Structurally and electro physiologically.[2]Both these processes show characteristics features of axons. Specifically pain and temperature is carried by thin myelinated and unmyelinated nerve fibres arising from small sized trigeminal neurons.[3]The aim of the present study the small sized neurons are mainly concerned with the transmission of pain and temperature from the periphery. These neurons were identified by localization of CGRP an important neuropeptide associated with transmission of pain.

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Aim and Objectives

To study the small sized neurones were identified by localization of CGRP.

Materials and Method

Male albino wistar rats (n=6) of weight ranging from 200g was the histomorphometry in the present study. The rats were obtained from experimental animal; facility of Saveetha Medical College. The animal were kept in cages with not more than the three animals in one cage. They were maintained at 12hrs:12hrs light/dark cycles with water and food available ad libitum.

Tissue Collection

Fixation was done using 500ml of 4% formaldehyde in 0.1M phosphate buffered saline, through transcardiac perfusion then dissect the rat brain trigeminal ganglion was identified and removed. Tissues were sectioned (20μm) using cryostat and stained with Cresyl violet.[4]

Morphometric Analysis of Trigeminal Neurons

The Cresyl violet stained sections were visualized using progRes image capture from senoptikprogRes capture pro 2.7 (Germany) in 20x objective in an e-600 nikon compound light microscope. The diameters of the neurons from energy fifth section were measured using progRes image analysis software. The measured diameters were then divided into three types small sized, medium sized and large sized using SPSS software.[5]

Results

Cresyl violet stained sections of the trigeminal ganglion showed that the majority of the neurons cell bodies were aggregated peripherally. Those situated more centrally were separated by nerve fibres. The cell bodies varied in size. The neurons substance. All the cell bodies were surrounded by satellite cells which could be identified by their smaller polyhedral nuclei. Neurons showing positive immuno staining for CGRP were relatively small in size. (Fig – 1 & 2)

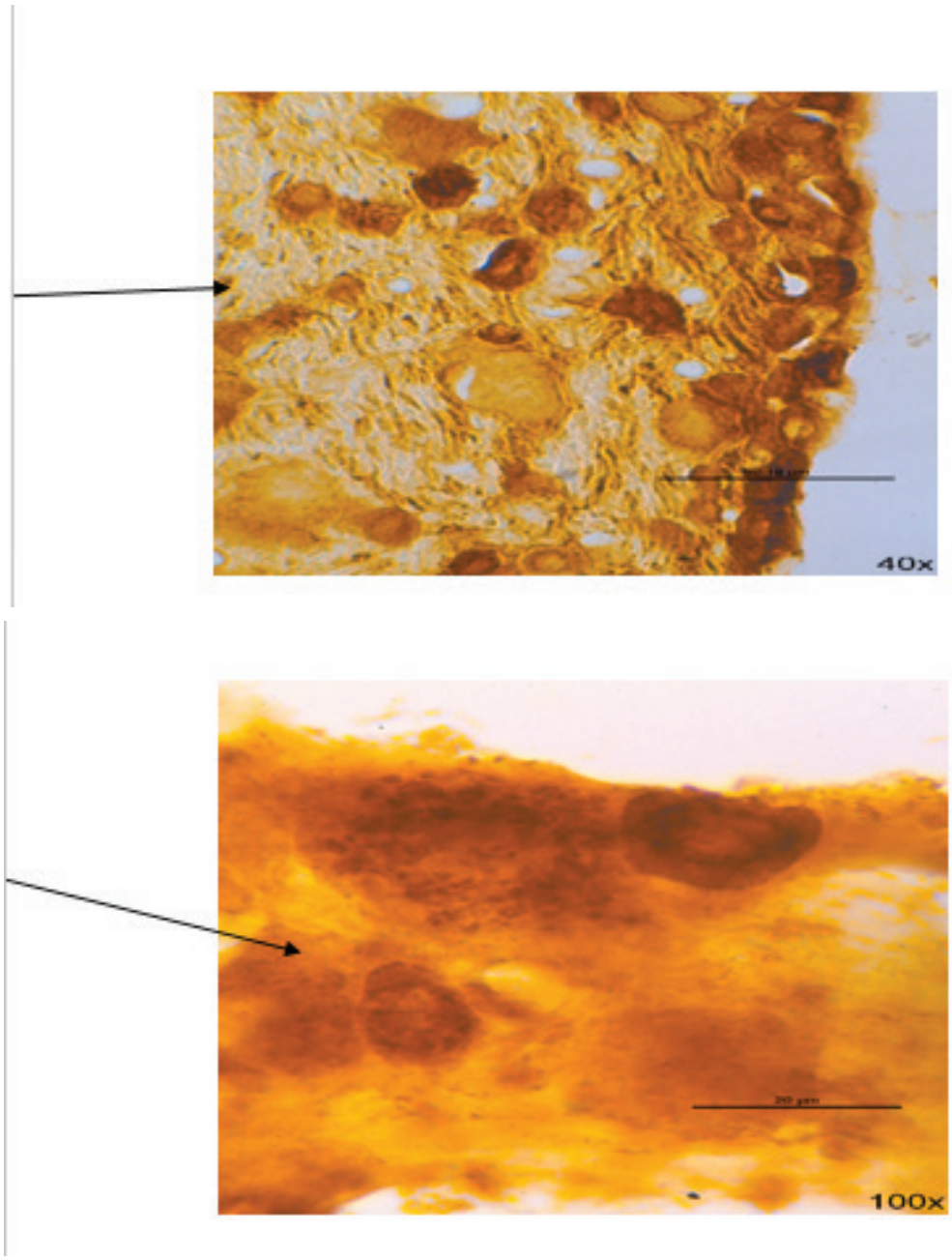

Figure 2 : Small neurons in trigeminal ganglion

Discussion

The present study showed that the cell bodies of the trigeminal ganglion neurons the findings of the present study suggest that the neuronal cell bodies could play a critical role in the pathophysiology changes occurring during disease processes. The small sized neurons which mediate pain and temperature sensation.[6]

The darker colour of the small neurons is due to the fact that the nissl granules are represented bo bigger isles composed by the longer cisterus of the cisterus of the rough endoplasmic reticulum and dispersed free ribosome in between them.[7] Using immunohistochemistry, it is proven that 46% of the small and medium-sized neurons situated in the trigeminal ganglion are immunoreactive and have a darker colour in tested animals after proving the heterogeneity of the cell population in the nervous system, the researches focussed on the secrets of the transmission of nervous processes and the importance of the neurotransmitters in this process studying the vegetative ganglion of an animal state that 20% of the neurons are GABA-ergic.[8, 9] The localization of GABA is in the small afferent neurons which are nociceptive it is thought that GABA is pain transmitter and modulator.[10]

The small sized neurons showed higher intensity of staining for the L-, P/Q; N- and T-channels.[11] The reason for this is not definitely known: however, Cresyl violet staining had shown extremely dense nissl substance in these neurons.[12] The presence of VSCCS in the nerve fibres indicated that the calcium channels were being possibly transported to the nerve ending. Satellite glial cells were noted to express R-VSCCS. Though the functional significance of this is unknown.[13, 14]Also trigeminal ganglion neuron and the satellite cells have been shown to communicated via gap junction and paracrine signalling though the small sized neurons conveying pain and temperature. [15, 16]

Conclusion

In conclusion, the results of the present study along with that of earlier studies suggest that small sized trigeminal ganglion neuron could take part in the modulation of various sensory stimuli including that of pain and temperature.

Conflict of Interest: No Conflict of Interest

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Ethical Clearance: Obtained from Institutional Animal Ethical Committee

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