

Segments of Spinal Cord Harboursing Motor Neuron Somata of Median Nerve in Rabbit

Israr Ahmad Khan¹, Farhan Kirmani², Mohd Imran³

ABSTRACT

Introduction: Median nerve is the main nerve of forearm. With knowledge of location of motor roots we can explain motor loss of different muscles of forearm. The study was conducted with an aim to see the segments of spinal cord harbouring motor neuron somata of median nerve in rabbit.

Material and methods: Six New Zealand white adult rabbits were used in the study. Retrograde changes, chromatolysis including cell body response were induced in the motor neuron somata of median nerve by sectioning the nerve of left side under general anaesthesia. The right side was used as control. The animals were sacrificed at an interval of 8 to 28 days after operation and perfused fixed in 10% buffered formalin. Cervical spinal cord segments (C4-C8) and thoracic spinal cord segments (T1 and T2) were processed for paraffin embedding. 40-micron thick serial transverse sections were obtained and stained with thionine. The stained sections were examined microscopically to identify the neuron somata showing retrograde changes including chromatolysis.

Results: Chromatolysis (or cell body response) was observed in the caudal part of fifth cervical (C-5) segment, the whole length of sixth to eighth cervical (C6-C8) segment and up to the middle of first thoracic (T-1) segment.

Conclusion: The length of the spinal cord harbouring motor neuron somata of median nerve extends from the caudal part of fifth cervical (C-5) segment up to the middle of first thoracic (T-1) segment.

Keywords: motor neuron somata, spinal cord segment, median nerve, chromatolysis

INTRODUCTION

Nervous system is the system that controls and co-ordinates other systems of body. It consist of highly specialized cells called neuron and neuroglia cells which are supporting cells. Most neurons consist of a central mass of cytoplasm within a limiting cell membrane, the cell body, perikaryon or soma, from which extend a number of branched processes, or neurites. One of these, the axon, is usually much longer than the others and conducts information away from the cell body. The other processes are termed dendrites and these typically conduct information towards the soma (cell body).

Nerve cell bodies stained with basophilic dyes such as thionine, cresyl violet, toluidine blue etc. show numerous microscopic clumps of Nissl granules or Nissl bodies, which consists of rough endoplasmic reticulum and associated ribosomal RNA.¹

When the axon is cut (axotomy), typical morphological changes can be seen in the cell body. There is swelling of the cell and the apparent disappearance of Nissl granules. All these changes are termed as Chromatolysis.² There is migration of the nucleus towards the periphery of the cell and an increase in the size of the nucleus, nucleolus, and cell body.

However, it has become increasingly clear that the morphological manifestations of this response are different in different cells, and the chromatolysis itself is not invariably seen.³ Hence the term "axon reaction", "retrograde reaction" or "cell body response"(CBR) have come to be considered more appropriate to designate the whole range of alterations that may occur.⁴⁻⁶ We can see the location of motor neuron somata of different nerves by producing chromatolysis or cell body response (CBR) in different animals. Location of motor neuron somata of different nerves supplying forelimb muscles have been studied by retrograde cell degeneration technique, by electrophysiological method, and by retrograde axonal transport of horseradish peroxidase (HRP).^{3,7-18} These studies have shown the locations of motor neuron somata of major forelimb nerves in the cervical enlargement of spinal cord.

The aim of present study is to find out cranio-caudal extent of spinal cord that harbours the motor neuron somata of the median nerve in rabbit.

MATERIAL AND METHODS

Six adult New Zealand white rabbits were used in this study. Three of them were females and three of them were males. The median nerve was cut in axilla just after where the two roots are meeting together to form the trunk of median nerve, on left side. The right side was used as control.

The operations were performed under general anaesthesia and aseptic conditions. Ether was used for general anaesthesia and inhalation route was used. The median nerve was exposed in left axilla and cut. A part of the trunk of nerve was also removed from the site of the cut to prevent reunion. Then the animals were sacrificed with an overdose of chloroform at intervals of 8 to 28 days after operation. They were immediately perfused, firstly by about 500 ml of normal saline (0.9% sodium chloride solution) followed by about 1500 ml of 10% formal saline.

On next day rabbit was dissected. Vertebral column was exposed after removing skin and muscles of the back. Spine and laminae of vertebrae were cut through bone cutter and spinal cord was exposed. Complete spinal cord including hindbrain was taken out. Segments of spinal cord was counted with the help of emerging spinal nerves. Fourth cervical

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to second thoracic segments of spinal cord were separated and kept in numbered containers filled with formalin solution. A small cut (nick) was given on right side for side identification. Tissue blocks of each segment were prepared after paraffin embedding. Serial transverse sections of each embedded segment were cut at 40 micrometers thickness. The sections (attached to albuminised slides) were stained with thionine stain and examined microscopically to identify the neuron somata showing “cell body response” (figure-1) or “typical chromatolysis” (figure-2).

RESULTS

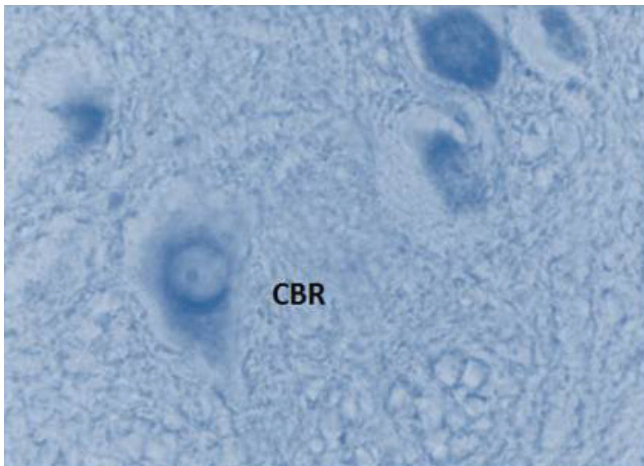
Chromatolysis (or cell body response) was observed in the caudal part of fifth cervical (C-5) segment, the whole length of sixth to eighth cervical (C6-C8) segment and up to the middle of first thoracic (T-1) segment (figure-3, 4).

DISCUSSION

The findings of the present study are nearly in agreement with the cat where motor neuron somata of median nerve were located from midlevel of sixth cervical (C-6) to mid to caudal region of first thoracic (T-1) segments.¹⁹ The findings of the present study are in near agreement with the cat where motor neuron somata of median nerve were located from caudal part of sixth cervical (C-6) to first thoracic (T-1) segments.¹² The findings of the present study are in near agreement with the study on cat where motor neuron somata of median nerve were located from caudal part of sixth cervical (C-6) to caudal part of first thoracic (T-1) segments.¹⁶ The findings of the present study are in near agreement with the study on monkey where motor neuron somata of median nerve were located from seventh cervical (C-7) segment to caudal part of first thoracic (T-1) segments.²⁰ In Albino rat it was found that the motor neuron somata of median nerve formed a group extending longitudinally from the cranial part of sixth cervical (C-6) to caudal part of first thoracic (T-1) segments, whereas in present study motor neuron somata of median nerve in rabbit were found from caudal part of fifth cervical (C-5) segment to upto middle of first thoracic (T-1) segments.²¹

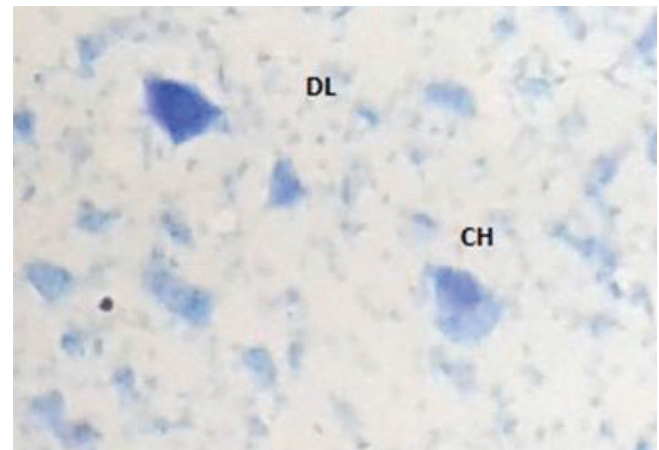
CONCLUSION

The length of the spinal cord harbouring motor neuron so-

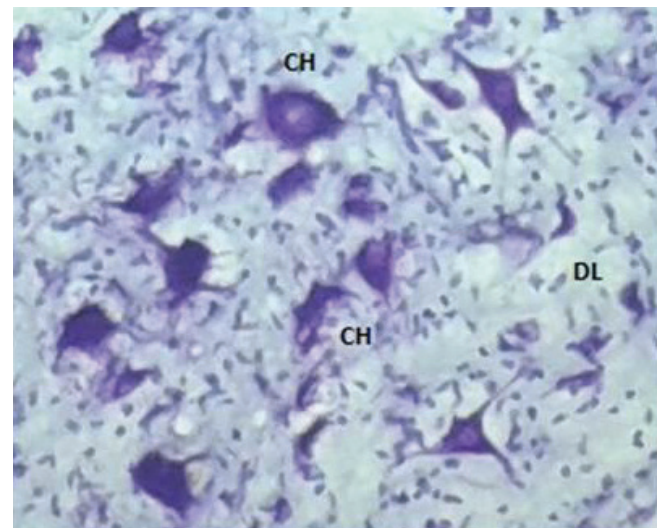


Figure–1: Photomicrograph of transverse section of spinal cord showing cell body response (CBR). Thionine stain X400

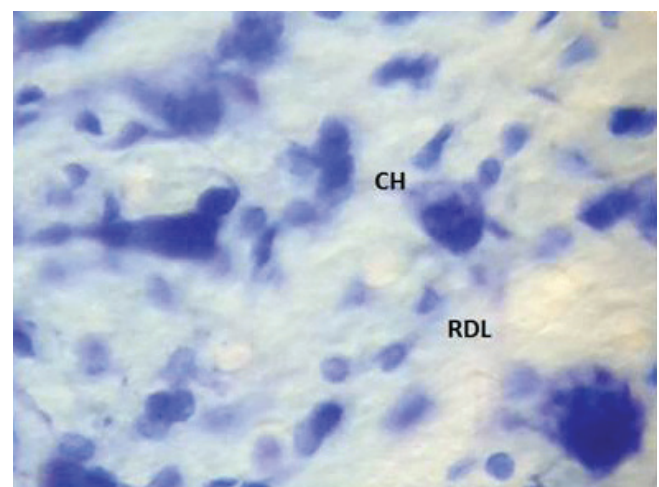
mata of median nerve extends from the caudal part of fifth cervical (C-5) segment up to the middle of first thoracic (T-1) segment.



Figure–2: Photomicrograph of transverse section of spinal cord showing chromatolysed neuron soma (CH). Thionine stain X400



Figure–3: Photomicrograph of a part of transverse section of spinal cord passing through caudal part of fifth cervical (C-5) segment showing chromatolysed cell (CH). Thionine stain X400



Figure–4: Photomicrograph of a part of transverse section of spinal cord passing through cranial part of first thoracic (T-1) segment showing chromatolysed cell (CH). Thionine stain X400

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