

## ORIGINAL RESEARCH

# Segments of Spinal Cord Harboursing Motor Neuron Somata of Ulnar Nerve in Rabbit

Mohd Imran<sup>1</sup>, Farhan Kirmani<sup>2</sup>, Israr Ahmad Khan<sup>1</sup>

## ABSTRACT

**Introduction:** There is paucity of literature as well as lack of consensus regarding the accuracy of cranio-caudal extent of spinal grey column that contains the motor neuron somata of ulnar nerve. Therefore the present study was undertaken to ascertain the cranio-caudal extent of spinal grey column that harbours the motor neuron somata of ulnar nerve.

**Material and method:** Six adult rabbits were included in this study. Under general anaesthesia the trunk of ulnar nerve of left side was surgically sectioned in lower part of arm. After post lesional survival period of 8-28 days, the animals were sacrificed and perfusion fixed in 10% buffered formalin. The cervical spinal cord segments 6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup> and thoracic spinal cord segments 1<sup>st</sup> and 2<sup>nd</sup> were processed for paraffin embedding. From all blocks 40 micron thick serial transverse sections were cut. Every 5<sup>th</sup> section was stained with thionine and studied microscopically to see the motor neuron somata showing either typical chromatolysis or cell body response.

**Results:** Cells showing chromatolysis or cell body response was observed in C7 (caudal part), C8 and T1 spinal segment.

**Conclusion:** The length of spinal cord harbouring motor neuron somata of ulnar nerve extends from caudal part of 7<sup>th</sup> cervical segment to 1<sup>st</sup> thoracic segment (except its caudal end).

**Keywords:** spinal cord, neuron somata, ulnar nerve, spinal cord segment.

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**Conflict of Interest:** None

## INTRODUCTION

In vertebrates, the neuron consists of cell body, perikaryon or soma from the surface of which usually project one or more processes or neurites. Location of motor neuron somata supplying forelimb muscles have been studied by retrograde cell degeneration technique,<sup>5-10</sup> by electrophysiological method,<sup>1</sup> and by retrograde axonal transport of horse raddish peroxidase (HRP).<sup>2,11-17</sup> These studies have shown the locations of motor neuron somata of major forelimb nerves in cervical enlargement of spinal cord.

There are only few investigations on the location of motor neuron somata of ulnar nerve,<sup>2,8-17</sup> and there is some disagreement concerning their distribution. For example in cat motor neuron somata of ulnar nerve were located in the seventh cervical (C-7), eighth cervical (C-8) and first thoracic (T-1) segments of spinal cord, whereas in dog<sup>14</sup> motor neuron somata of ulnar nerve were located from cranial part of C-7 to cranial part of T-2,<sup>1,12</sup> while in monkey ulnar nerve motor neurons were located in caudal part of C-8 and rostral part of T-1,<sup>2</sup> whereas in albino rat motor neuron somata of ulnar nerve were located from caudal part of sixth cervical (C-6) to rostral part of second thoracic (T-2) segments of spinal cord.<sup>17</sup>

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

## MATERIAL AND METHODS

Six adult rabbits were used in this study. Three of them were females and three of them were males. Initially several dissections were performed in sacrificed animals to ascertain the formation and distribution of the ulnar nerve on both sides and to decide upon the procedure for its surgical exposure. Ether was used for general anaesthesia and inhalation route was used. The ulnar nerve was sectioned in lower part of arm just above the elbow on left side. The right side was used as control. Animals were allowed to survive for 8-28 days. After post lesional survival period of 8-28 days the animals

were sacrificed with an overdose of chloroform. They were immediately perfused through the left ventricle of heart. Before starting the perfusion, one of the superficial veins was cut in the neck. During perfusion, firstly about 500 ml of normal saline (0.9% sodium chloride solution) was injected. This was followed by an injection of about 1500 ml of 10% formal saline. Twenty-four hours after perfusion, the spinal cord and hindbrain were exposed by the dorsal approach (i.e. by laminectomy and destruction of skull). The cervical and upper thoracic segments of the spinal cord along with the hindbrain were removed.

The sixth, seventh and eighth cervical segments and the first and second thoracic segments of the spinal cord were identified, separated from each other and nick was given on right (control) side to identify the side of spinal cord. Then spinal cord segments were embedded in paraffin. Tissue blocks of each segment were prepared. Serial transverse sections of each embedded segment were cut at 40 micrometers thickness. Every 5<sup>th</sup> section (attached to albuminised slides) was stained with thionine and examined microscopically to identify the neuron somata showing "typical chromatolysis" (figure-1) or "cell body response".<sup>3,4</sup>

## RESULTS

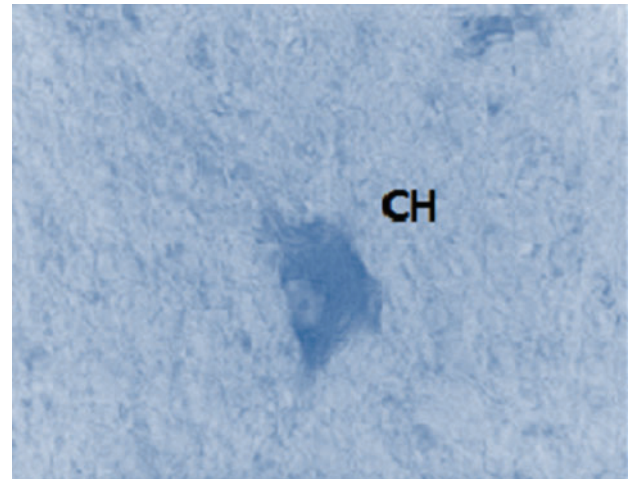
Neuronal somata with "typical chromatolysis" or "cell body response" were observed in the caudal part of seventh cervical (C-7) segment, the whole length of eighth cervical (C-8) segment and almost whole length of first thoracic (T-1) segment except its caudal end (figures - 2,3,4).

## DISCUSSION

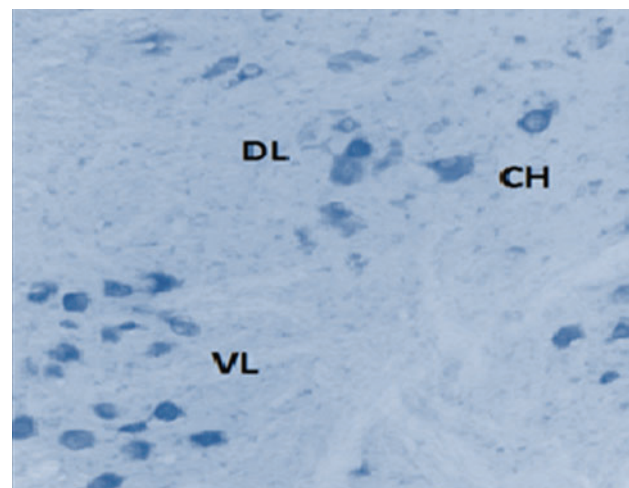
This study is linked to fractures, nerve damage, muscle paralysis and peripheral nerve injuries. The findings of the present investigation are in agreement with cat in respect of location of ulnar motor neuron somata of the spinal cord.<sup>1</sup>

The findings of the present work are nearly in agreement with monkey where the motor neuron somata of ulnar nerve were located in the C-8 and T-1.<sup>9</sup> The findings of the present investigation in rabbit do not fully agree with monkey in which the motor neuron somata of five intrinsic muscles of hand (including those innervated by ulnar nerve) were localized in segments C-8 and T-1 and some of them in T-2 also.<sup>3</sup>

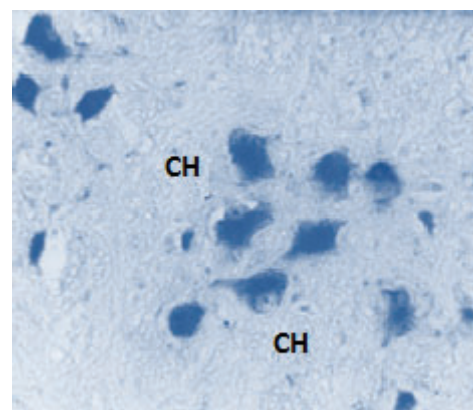
The findings of the present work are almost in agreement with cat where the motor neuron somata of ulnar



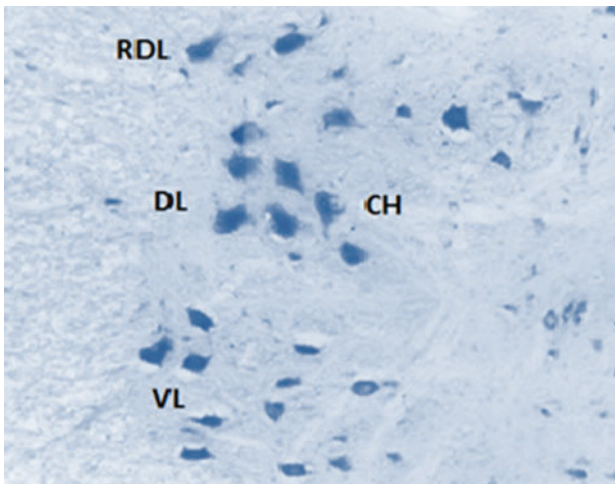
**Figure-1:** Photomicrograph of transverse section of spinal cord showing a chromatolysed cell (CH). Thionine stain. 400x.



**Figure-2:** Photomicrograph of a part of transverse section of spinal cord passing through caudal part of seventh cervical (C-7) segment showing a chromatolysed neuron soma (CH) in ventral grey horn. Thionine stain 100x.



**Figure-3:** Photomicrograph of a part of transverse section passing through eighth cervical (C-8) segment showing typical chromatolysed cell (CH) in ventral grey horn. Thionine stain. 100 X.



**Figure-4:** Photomicrograph of a part of transverse section passing through first thoracic (T-1) segment showing chromatolysed neuron soma (CH) in ventral grey horn. Thionine stain. 100X

nerve formed a group which extended from the caudal part of C-7 to the caudal part of T-1 and that the distribution was maximum in the caudal part of C-8 and rostral part of T-1.<sup>12,13</sup> In dog it was found that the motor neuron somata of ulnar nerve formed a group extending longitudinally from the cranial end of C-8 to the cranial third of T-2. The findings of the present investigation do not completely agree with dog in terms of involvement of T-2.<sup>14</sup> The findings of the present investigation do not fully agree with albino rats where the motor neuron somata of ulnar nerve were located from caudal part of C-6 to rostral part of T-2; however in present investigation the neuron somata were found to be located in the caudal part of C-7 segment, the whole length of C-8 segment and almost whole length of T-1 segment except its extreme caudal part.<sup>17</sup>

## CONCLUSION

Length of spinal cord harbouring motor neuron somata of the ulnar nerve in rabbit extends from caudal part of seventh cervical (C-7) segment to caudal part of first thoracic (T-1) segment except its caudal end.

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