

ABSTRACT

Localization of the motor neuron somata of the median nerve in Albino rat.

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Introduction:

The position of the median motornuclei and also the rostral and caudal limits of the location of motor neuron somata of median nerve in the spinal cord has been investigated

Methodology:

Twelve Albino rats (Sprague – Dawley) of either sex were used in the study and divided into two groups, Gp1 & Gp11 .

GROUP-1: The animals of this group further divided into two subgroups (Gp1A and Gp1B) Under general anaesthesia (Nembutal sodium at a dose of 30 mg / kg. weight intraperitoneally), the right median nerve was exposed in the axilla, cut and a part of it removed to prevent reunion. In other group the right median nerve was exposed just above the wrist before it gives any branch and a portion removed to prevent reunion . The left side acted as control. The animals were sacrificed 3 – 5 weeks after operation, circulation was flushed with normal saline and perfused with 10 % formal saline at a pressure of 125mm Hg. The 5th, 6th, 7th, 8th, cervical and 1st, and 2nd, thoracic segments of the spinal cord were removed by dorsal approach, separated from each other and embedded in paraffin. Their serial sections were cut at 40 micrometers and stained with thionine for nissl granules. The sections were examined microscopically to identify the chromatolysed neuron somata. From the the transverse serial sections a reconstruction of the cell column was made.

GROUP – 11: In this group , the motor neuron somata was localized by using the horseradish peroxidase (HRP). The right median nerve was cut in the axilla under general anaesthesia (like above) and its proximal stump will be put in a small container filled with HRP (30%) for 90 minutes. After 48-72 hours of survival, the animals were re-anaesthetized and perfused transcardially with saline followed by fixative (0.5% paraformaldehyde, 1.25% glutaraldehyde, Ph 7.2) and fixative containing sucrose (30%). The 5th, 6th, 7th, 8th, cervical and 1st and 2nd thoracic segments of the spinal cord were removed and transverse frozen sections were cut at 60 microns with a cryostat treated with tetramethyl benzidine . The sections were examined microscopically for tracer positive somata and their locations. from the serial transverse sections a reconstruction of cell columns was made.

Results:

In those animals in which median nerve cut in the axilla: Chromatolysed neuron were observed in the 6th, 7th, & 8th cervical & 1st thoracic segments of the spinal cord.

Those animals in which median nerve was cut at wrist: chromatolysed neuron were observed in the 8th cervical & 1st thoracic segments of the spinal cord.

Horseradish peroxidase(HRP) technique: HRP was applied to the proximal cut end of median nerve in the axilla. HRP-labeled cells seen in 6th 7th 8th and 1st thoracic segments of the spinal cord.

HRP was applied to the proximal cut end of median nerve at the wrist. HRP- labeled cells were observed in 8th and 1st thoracic segments of the spinal cord.

Conclusions:

The motor neuron somata of median nerve in Albino rat are located in the 6th 7th 8th and 1st thoracic segments of spinal cord.

In 6th and 7th segments neurons were located in the dorsolateral(DL) and retrodorsolateral (RDL) cell columns of the ventral grey horn of spinal cord.

Median nerve supplying the hand muscles are located only in the retrodorsal (RDL) cell column of ventral grey horn of 8th cervical and 1st thoracic segments of spinal cord.

Localization of the motor neuron somata of the Median nerve in Albino rat.

INTRODUCTION

The motor neuron somata of the median nerve supplying the forearm muscles and the hand arise in the cervical and upper thoracic segments of the spinal cord. There are many conflicting views regarding the rostral and caudal limits of the location of these neurons and also their location in the ventral grey horn of the spinal cord. The median nerve motor nucleus is located in C5-T1 spinal segments in wobbler mice by Pollin (1990). Some investigators(Mutai, Shibata, and Suzuki, 1986) located these neurons in the dorsolateral and retrodorsal nucleus of ventral grey horn at levels from the cranial tip of C7 to the cranial third of T2. they also observed that the motor neuron supplying the proximal muscles of the upper limb were more caudally situated, whereas those supplying the caudal muscles were situated more caudally. According to (jenny and Inukai 1983) motor columns innervating the forearm muscles with similar actions on the hand appear to overlap in the anterior horn, also motoneurons controlling hand movement are located in C8 and T1 segments. To investigate the motor neuron somata of the median nerve and also rostral and caudal limits of the location of motor neuron somata of median nerve in the spinal cord of Albino rat.

MATERIALS AND METHODS

Twelve Albino rats (Sprague-Dawley) of either sex were used in this study . The animals were divided into two groups of 6 animals each, group -1 and group-11.

Group-1: The animals of these group were divided into two subgroups.

(Table 1). Under general anaesthesia (Nembutal sodium, at a dose of 30 mg per kg, intraperitoneally) and aseptic condition. In gp-1A the trunk of the right median nerve was exposed in the axilla and a portion removed to prevent reunion. In gp-1B the right median nerve was exposed above the wrist before it gives any motor branch for the hand and a portion removed to prevent reunion.

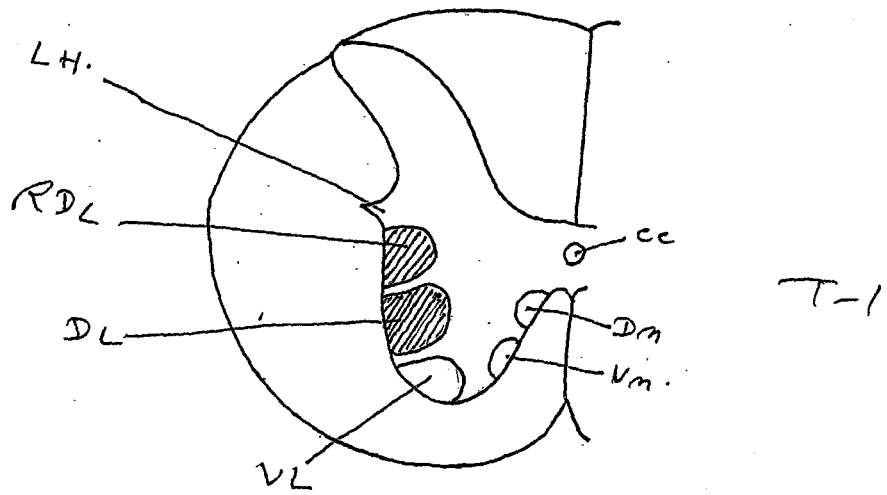
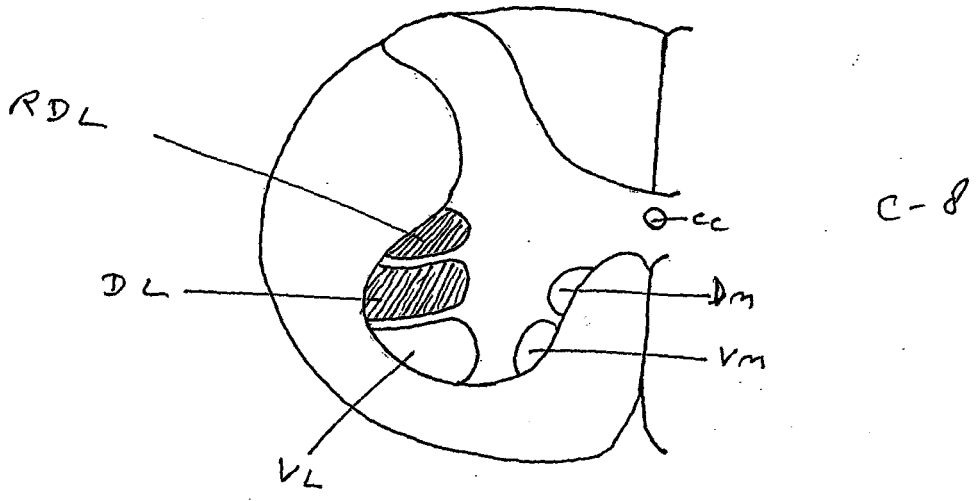
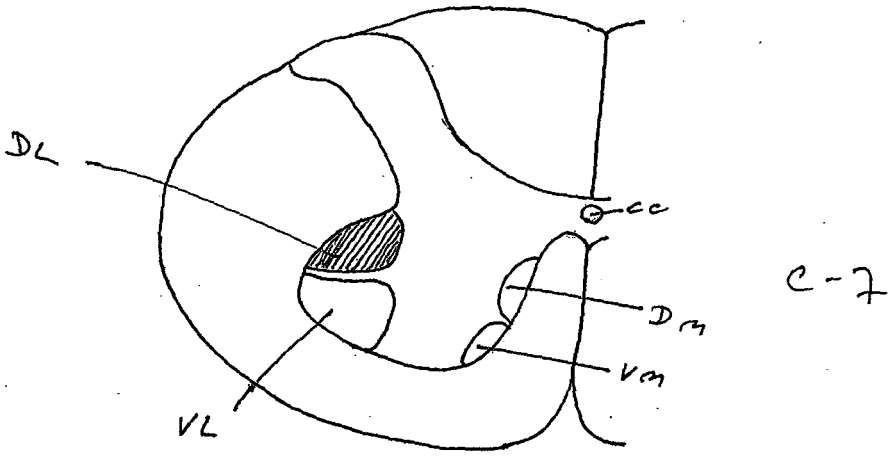
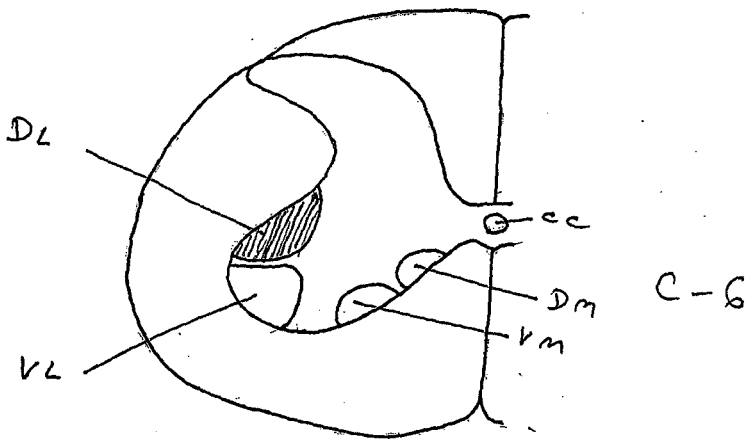
After 2-4 weeks the animals were killed, and the circulation flushed with normal saline and perfused with 10 % formal saline through the left ventricle of heart at a pressure of 120 mm of mercury. Immediately after perfusion the remaining portion of the median nerve will be examined after thorough dissection to ensure that the nerve had been cut at the desired level.

The 5th, 6th, 7th, and 8th, cervical and the 1st and 2nd thoracic segments of the spinal cord were removed, using a dorsal approach. These segments were embedded in paraffin wax and serial transverse sections cut at a thickness of 40 Micrometers (microns). All sections were affixed to slides and stained with thionine. They were examined microscopically to identify the cell columns containing the chromatolysed cells and for comparisons to be made between the experimental right side with the control left side.

Group-11: Remaining 6 animals were divided into two sub groups(table 2), the median motor neuron cell bodies will be localized using the horseradish peroxidase (HRP) technique(Friet al., 1982). In gp-11A the right median nerve was cut in the axilla under general anaesthesia (Nembutal sodium, 30 mg per kg body weight), and its proximal stump was immediately put in a container filled with HRP 30 % where it will remain for

ibm nerve cut in axilla

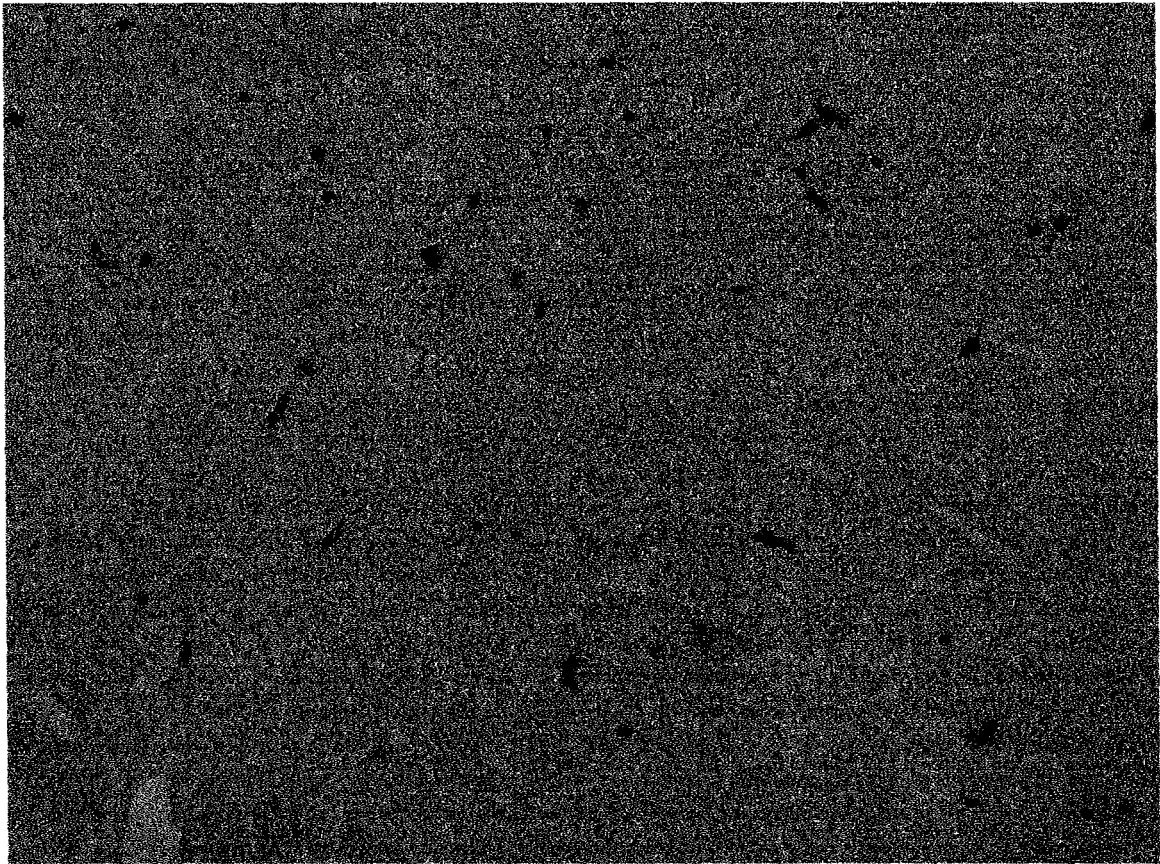
(Fig 1a)



Fig, 1. Cervical 8th ,segment



Fig. 2. Thoracic 1st segment (HRP- labeed cell)



part of the spinal cord. Thus, motoneurons innervating forearm muscles were well organized somatotopically not only in the transverse plane, but also along the longitudinal axis of the spinal cord. Median nerve supplying the hand muscles were located more caudally in the 8th cervical and 1st thoracic segments, they are present only in the retrodorsal (RDL) column of ventral grey horn of the spinal cord. Fritz, Illert, Reece (1982) used horseradish peroxidase (HRP) technique to investigate the location of the motor nuclei of the median and ulnar nerves. Each nucleus is described its longitudinal extent along the rostro-caudal spinal cord axis and by its dorso-ventral and medio-lateral position within the ventral horn, they also demonstrates the complete overlap of two different nuclei. Jenny and Inukai (1983) observed that the motor columns innervating the forearm muscles by the median nerve and ulnar nerve with similar action on the hand appear to overlap in the ventral grey horn. They further observed that the motor neurons controlling the hand muscles were located in C8 and T1. According to Iwamoto, Haber, Dixon, Gonyea (1980) the motor neuron somata of flexor carpi radialis supplied by the median nerve are located in the spinal cord segments C6-T1. Saito (1986) observed that the motor neuron neuron somata of the median nerve were present in three discrete fusiform cell columns within the dorsolateral part of the ventral grey horn of spinal cord extending from C6- T1 segments.

CONCLUSIONS

As a result of this study, the conclusions drawn were as follows:

1. The motor neuron somata of median nerve in Albino rat are located in the 6th, 7th, 8th, and 1st, thoracic segments of spinal cord.
2. In 6th, 7th, cervical segments, these motor neuron somata were located in the dorsolateral (DL) cell column,
Whereas in 8th, cervical and 1st thoracic segments these somata were located in the dorsolateral (DL) and retrodorsolateral (RDL) cell columns of the ventral grey horn of spinal cord.
3. The motor neuron somata of the median nerve supplying the muscles of hand are located only in the retrodorsal (RDL) cell column of ventral grey horn of 8th cervical and 1st thoracic segments of spinal cord.

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