

# INTERNAL STRUCTURE OF HUMAN CRUS CEREBRI

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## SYNOPSIS

**Twelve midbrains of adult humans at the level of the superior colliculus were examined microscopically after being stained with Bodian and Holmes silver stains. The crus cerebri was found to contain in between the massive band of the nerve fibres collections of medium sized polygonal nerve cells. The significance of these findings were discussed.**

## INTRODUCTION

Anatomical and physiological studies on the midbrain have demonstrated that the most ventral part of the midbrain contains a massive band of descending corticofugal fibres, the crus cerebri.

According to Dejerine, (1901) the medial three-fifths of the crus cerebri contain somatotopically arranged corticospinal and corticobulbar fibres.

Others authors such as Flechsig (1905); Von Monakow (1905) and Quensel (1910) indicated that smaller portions of the central part of the crus cerebri contained these fibres. Fibres in the most lateral part of the central region are concerned with the lower extremity; the larger middle region contained fibres concerned with the upper extremity; and the most medial fibres of the central region are associated with the musculature of the face, pharynx and larynx. The extreme medial and lateral portions of the crus cerebri contained corticopontine fibres. Frontopontine fibres are medial, while corticopontine fibres from the temporal, parietal and occipital cortices are located laterally.

Wright (1972) described the crus cerebri as masses of white matter; the middle three-fifths are occupied by the pyramidal tracts; the medial one-fifth by frontopontine and corticonuclear fibres and the lateral one fifth by temporo-pontine fibres.

Carpenter (1970) described extensions of the substantia nigra cells sometimes into the crus cerebri.

So it appeared of interest to subject the crus cerebri of the human midbrain to closer investigations.

## MATERIAL AND METHODS

Twelve human adult specimens were collected from the postmortem department the midbrains were fixed in Bodian fixative, dehydrated, cleared and embedded in paraffin, serially sectioned at the superior

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collicular level at 15  $\mu$ m thickness and stained with Bodian and Holmes silver stains.

The sections were taken from the plane of the oculomotor nucleus.

## RESULTS

The crus cerebri consisted mainly of a massive band of nerve fibres. Collections of nerve cells were observed amongst these fibres (Fig. 1). These aggregated nerve cells were neither confined to a special site in the crus cerebri nor had a particular configuration, but were observed as groups of nerve cells scattered along the whole length of the crus cerebri (Figs. 1 and 2).

The cells were medium sized, polygonal in shape with a clear sharply defined plasma membrane which separated the faintly stained cytoplasm from the surrounding nerve fibres (Fig. 3).

The cells possessed large nuclei in relation to the cell size, the nuclei were oval in shape and eccentrically placed in the majority of the cells (Fig. 4). The nuclei possessed a clear nuclear membrane that demarcated the nucleus from the cytoplasm (Fig. 5). In some fields the nuclei contained two nucleoli (Fig. 5).

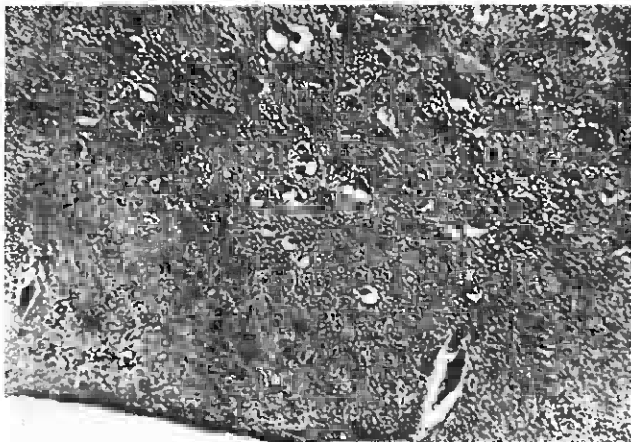


Figure 1. Photomicrograph of nerve cells present in between the nerve fibres of the crus cerebri. Holmes Silver Stain X50.

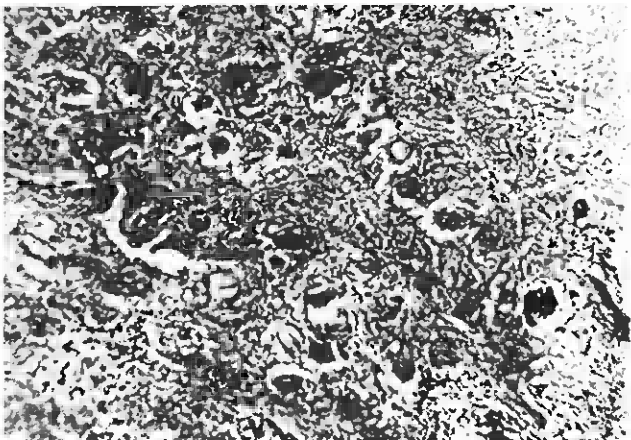


Figure 2. Photomicrograph of a collection of nerve cells in the crus cerebri. Holmes Silver Stain X100.

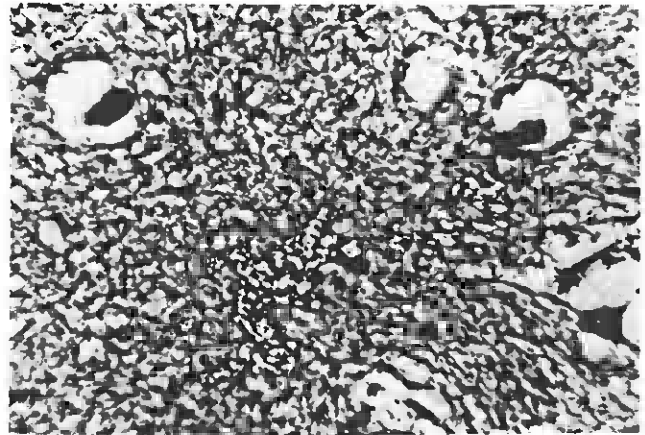


Figure 3. Photomicrograph of nerve cells with clear plasma membrane. Bodian Silver Stain X 250.

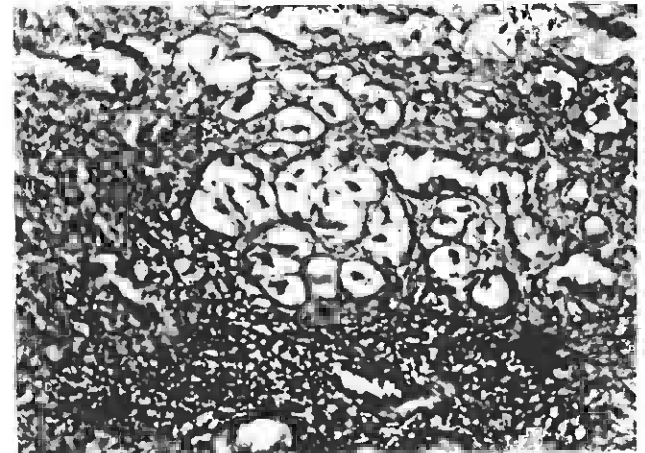


Figure 4. Photomicrograph of a collection of nerve cells, the majority of the cells possess oval or elongated nuclei. Bodian Silver Stain X100.

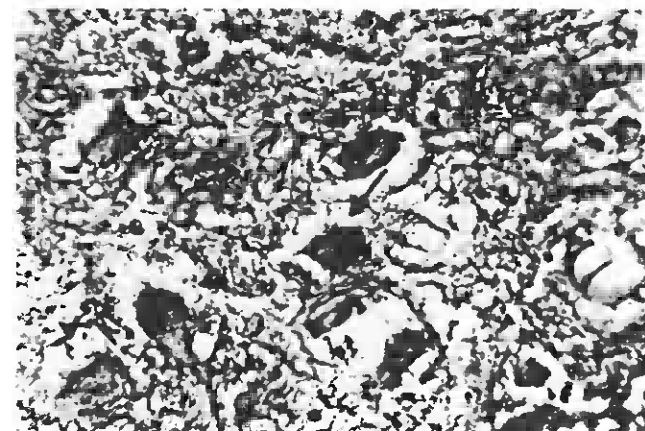


Figure 5. Photomicrograph of nerve cells with darkly stained nuclei, one nucleus contains two nucleoli. Holmes Silver Stain X 250.

## DISCUSSION

Dejerine (1901); Flechsig (1905); Von Monakow (1905); Quensel (1910); Roger Warwick and Peter L. Williams (1975) described the crus cerebri as consisting of nerve fibres projecting from the cerebral cortex and carrying impulses from the cerebral cortex to the spinal cord, motor nuclei of the cranial nerves and to the pontine nuclei. It was clear in our results that the crus cerebri consisted of nerve fibres and groups of medium sized polygonal nerve cells.

Carpenter (1970) stated that islands of the reticular zone of the substantia nigra that lay close to the crus cerebri and which were composed of scattered cells of irregular shape and were rich in iron but contained no melanin pigment had been seen penetrating in between the fibres of the crus cerebri, but in our results the recorded cells were found as collections and not scattered, and they were polygonal and not irregular in shape as those described by Carpenter (1970).

According to many text books of human anatomy and embryology, Roger Warwick and Peter L. Williams (1975); Beck, Moffat and Lloyd (1973); Hamilton, Boyd and Mossman (1952) and Leslie Brainerd (1948) the pontine nuclei and the olivary nuclear complex were developed from migrated cells from the alar laminae of the metencephalon and myelencephalon. Since abundant migration of cells within the central nervous system has been observed (Levi-Montalcini, 1950; Wilhelm, 1954) the neurons in the crus cerebri of the present study might have originated from the substantia nigra as stated by Carpenter (1970). However, these neurons did not resemble those of the substantia nigra. Or possibly they represent a group of cells similar to the nuclei pontis

which has migrated cranially into the crus cerebri while the rest of cells had migrated caudally to form the nuclei pontis of the ventral part of the pons.

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