

## HISTOLOGICAL STRUCTURE OF SPINAL CORD IN QUAIL *COTURNIX COTURNIX* (LINNAEUS, 1758)

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### ABSTRACT

The study is done in the period between (February 20 and October 20) by using ten adult quail *Coturnix coturnix* (Linnaeus, 1758). The sections are preparing by paraffin method then stain in Harris haematoxylin-eosin. The histological aspects of spinal cord in quail (*Coturnix coturnix*) the white matter is in the outer part, while the gray matter is arranged in from of X represents its internal part, the dorsal region is called the dorsal horns while the ventral region is called the ventral horns and the central canal cavity, the spinal cord areas appeared as follows: The medial column, column of von Lenhossek, lateral column, dorsal magnocellular column and marginal paragriseal, columns are also called Hoffmann's nuclei.

**Keywords:** Histology, Spinal cord, Quail, Iraq.

### INTRODUCTION

A quail is one of the most widespread migratory birds in the world, as it is frequent in Iraq during the migration at the spring and autumn, and they stay numbers of it in the winter, it is called Almerai or A large. Number of migration from Europe during the autumn to reach Egypt and is called Quarantine. This bird is also in Syria it is called the Feri (Loess, 1961, Sanchez-Donoso *et al.*, 2012).

The spinal cord, a part of the central nervous system that connects to the myelencephalon and extends within vertebral canal (Jacobson, 1991; Kardong, 2006; Carvallo *et al.*, 2011). The spinal cord is symmetrical on both sides and there are a pair of incisions the dorsal medium spatium and ventral medium fissure, it consists of two regions, the internal region called gray matter which appear in the from butterfly shaped, it consists of two anterior horns and two posterior horns, they consist of nerve ganglion cells as well as the nerve fibres efferent (Jarvis, 2009).

The external material represents the white matter and consists of bundles of nerve fibres, which are the front and back fibres (sensory and motor fibres). (Kardong, 1998; McKinley & Oloughlin, 2006). The spinal cord in its centre contains a small space called the central canal, which is filled with cerebrospinal fluid and extends along the spinal cord, as it reaches the end of the fourth ventricle (4<sup>th</sup> ventricle) of the brain (rhombencephalon) (Nauta & Feirtage, 1986; Baumel, 1993; Sakka *et al.*, 2016).

Stability and movement in vertebrates are controlled by a group of spinal motor centres and deal with external (environmental) and internal requirements. The motor centres are providing within formation through the sensory systems. The sensory neurons participate in the spinal cord to control the

standing and movement on the ground (Delius & Vollrath, 1973; Grillner *et al.*, 1984; Orlovsky *et al.*, 1999; Flanders, 2011).

The meninges encapsulate the brain and spinal cord and the meninges are formed in birds as in the rest of vertebrates of the dura matter, arachnoid and pia mater (Chung *et al.*, 1982; LeDoudrin & McLaren, 1984; Mader, 1996; Gardner & Lane, 1998; McKinley & Oloughlin, 2006).

### MATERIALS AND METHODS

The study is done in the period between (February 20 and October 20) in Baghdad College of Education for Pure Science (Ibn Al-Haitham) in the department of Biology. Ten adult quail *Coturnix coturnix* (Linnaeus, 1758).

The samples of spinal cords fixed in formalin solution (10%) for 24 hours (Khan *et al.*, 2011; Bancroft & Stevens, 2013). The samples dehydrate in graded concentrations ethyl alcohol (70%-99%), the clearing of the samples had been performed by xylene, two exchanges done, one hour for each. The infiltration and embedding were used paraffin wax, two changes were performed on two hour for each. Then the samples were transferred to blocked in paraffin wax.

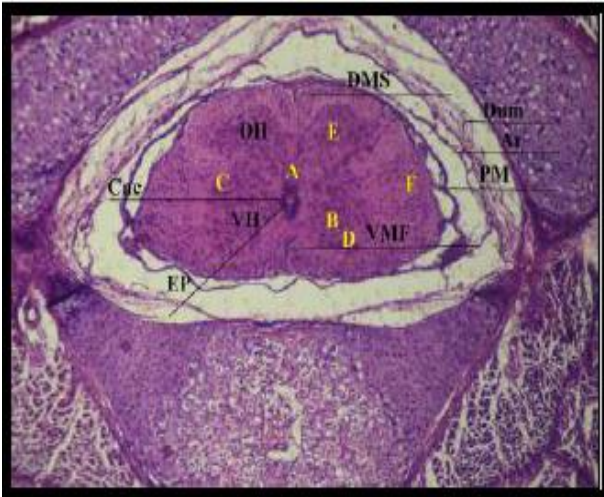
Serial section of 5 µm thickness were cut using the electrical microtome the slides transferred to the xylene for the dewaxed and passing the slides through graded less concentrations of ethyl alcohol (99%-70%), then the slides were transferred to be hydrated in distilled water. The slides were stained in Harris haematoxylin and eosin and mounted by dextrin plastinizer xylene (DPX) (Bancroft and Layton, 2013; Hameid *et al.*, 2018). The histological sections were observed by compound light microscope (Olympus, Japan).

**RESULTS**

**Histological structure of spinal cord:** The aim of the study was to identify the histological structure of spinal cord and study its tissue layers in adult birds. In present study found the white matter in outer part while the gray matter was arranged in the form of X shape (Pal *et al.*, 2003). It is called in dorsal region the dorsal horns, which has on average length of

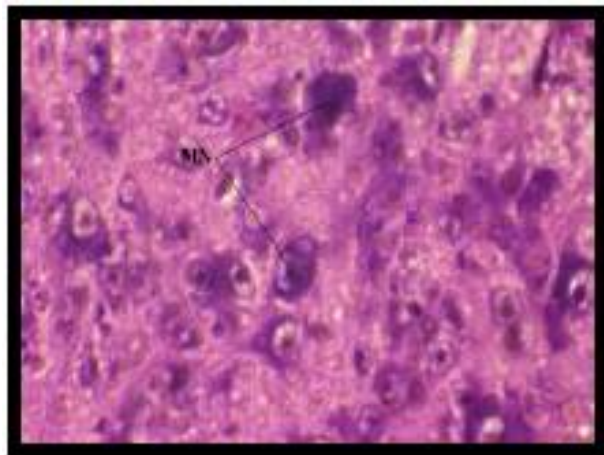
about (210) micrometres and a mean width of (52) micrometres.

In the ventral region, it is called ventral horns and has a rate of (210) micrometres and a width of (105) micrometres (Figure 1), the spinal cord was symmetrical in its composition on either side of the central canal, which was surrounded by ependyma with a thickness of (21) micrometres (Figure 1-A).



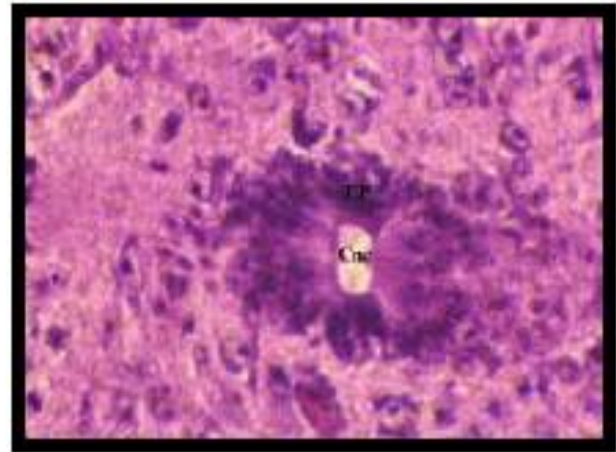
**Fig 1:** Cross section through the spinal cord of quail showing

Central canal (Cnc), Dura mater (Dum), Arachnoid (Ar), Pia mater (PM), Dorsal horn (DH), Ventral horn (VH), Posterior median septum (DMS), Anterior media, sulcus (VMF), Ependymal cell (Ep), (10x, H&E)



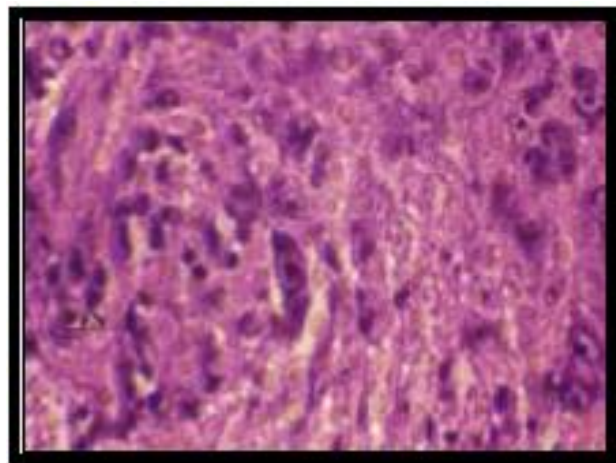
**Fig 1A:** Magnifying part (A) showing histological structure of the spinal cord lining, showing: Central canal (Cnc), Ependymal cell (Ep), (100x)

Spinal cords areas appeared as follows: The medial column: It is a region located at the centre of the ventral horn consisting of multipolar neurons and was spread along the spinal cord (Figure 1-B).



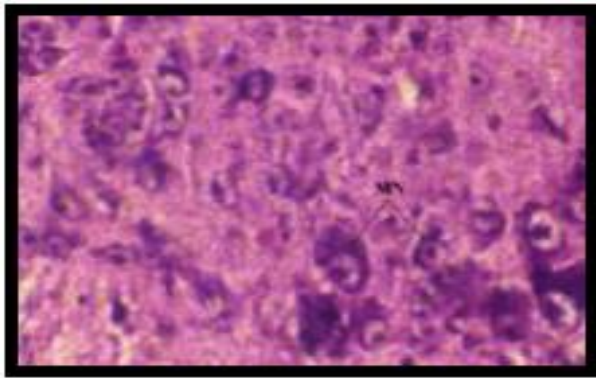
**Fig 1B:** Magnifying part (B) showing histological structure of the medial column, showing: Multipolar neurons (MN), (100x)

Column of Von Lenhossek: Is a region located at the level of central canal on either side of the dorsal side of ventral horn and consists of small-sized neurons and fusiform neurons (Figure 1-C).



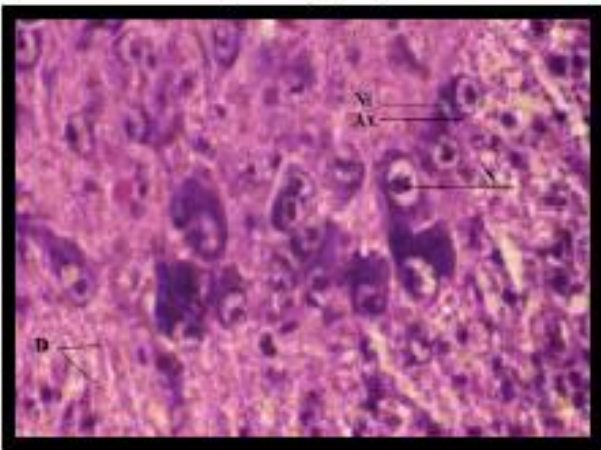
**Fig 1C:** Magnifying part (C) showing histological structure of the column of Von LenHossek, showing: Fusiform neurons (FN), (100)

Lateral column: It is a region located in the lateral side of the ventral horns. The lateral column appears as having multipolar neurons with large sized, electrodes containing axon extending to enter the ventral root. The lateral column was divided into the pars medialis and has two pars lateralis (Figure 1-D).



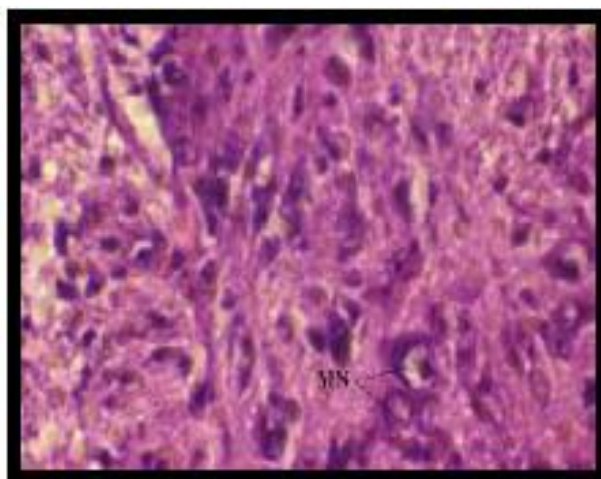
**Fig 1D:** Magnifying part D showing histological structure of the lateral column, showing:

Multipolar neurons (MN), (100x). Dorsal magnocellular column: It is a region located in the base of dorsal horns, containing a group of large-sized neurons (Figure 1-E).



**Fig 1E:** Magnifying part (E) showing histological structure of the dorsal magnocellular column, showing: Nucleus (N), Axon (Ax), Dendrites (D), Nissl substance (Ni), (100x)

Marginal paragrised columns: these columns are also called Hoffmann's nuclei, it is observed that it is located at the sides of white matters, it contains large-sized multipolar neurons (Figure 1-F).



**Fig 1F:** Magnifying part F showing histological structure of Hoffmann's nuclei, showing: Multipolar neurons (MN), (100x).

The white matter is divided into two axes by pair of incisions, namely the dorsal median septum and ventral median fissure as it extends vertically toward the gray matter (Figure-1).

## DISCUSSION

The spinal cord is a part of the central nervous system, located in the vertebral column, and it receives and transport nerve impulses. (Ross & Pawlina, 2006). The spinal cord in most vertebrates including tortoises and domesticated mammals contains the dorsal median groove and ventral median fissure dividing the spinal cord into two halves, half a right and one half left (Kardong, 1998; Carvalho *et al.*, 2011).

This corresponds to the results of the current study Junqueira *et al.*, (1998) pointed out that the gray matter of spinal cord contains the bodies of neurons, dendrites and the beginnings of axons of unmyelinated neurons as well as glial cells representing synapses that corresponds to the current study.

Eroschenko (2008) also pointed out that the spinal cord contains large-sized multipolar neurons especially in the dorsal horns, which represent large motor neurons, this corresponds to the results of the current study. The spinal nerve fibres graduate in the spinal cord from the motor ventral roots and sensory dorsal roots, as the ventral roots emerge from the bodies of the ventral horns of the gray matter of the spinal cord while dorsal roots emerge from the bodies of the cells that fall in to the spinal ganglion (Desmond & Field, 1992, Farner & King, 1974).

Roelink *et al.* (1994) pointed out that spinal sonic hedgehog gene expressed during the early stage of embryonic formation is induced to induce and differentiation the motor neurons in the spinal cord.

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