

## **Histopathology Study of the Vitamin B12 Effect of Nerve Regeneration after Transection in Rat**

**Marwa Adil Hameed**

Department of Anatomy , College of veterinary medicine, Tikrit University, Tikrit, Iraq.

### **Abstract**

The nerve regeneration in the peripheral can start after the nerve injury, but in the central nerve the process is very complex. The nerve injury classified to many types according to the severity on injury. Vitamin B12 have the ability to increase the Schwann cells and accelerate the nerve regeneration and increase the nerve myelin. We have 12 rat divided to two group each group 6 animals, all the animals have the transaction in the Sciatic nerve and sutured. The control group left without any added and the treated group given vitamin B12 orally 14 days.

The nerve was examined by the histopathological examination and the result was showed the best and the faster regeneration was for the treated group.

**Key word:-**Nerve regeneration, Vitamin B12

### **Introduction**

The peripheral nerves divided into motor, sensory and autonomic; the motor and autonomic are efferent neurons which receive signals from the spinal cord taking them to the body organs; while sensory nerves have a reverse action is called afferent nerve, that is then divided to two parts the somatic and the visceral ones (1). Classification of the peripheral nerve injuries were considered according to the type of nerve injuries including: Seddon classification: Three major classification are existed according to Seddon; neurapraxia, axonotmesis, and neurotmesis. The first one refers to temporary loss of function with no any loss of the continuity of the nerve. The axonotmesis is defined when only intact perineurium and epineurium is observed however, the axon and its myelin sheaths are totally affected. While, complete discontinuity of the whole nerve leading to loss of function is called Neurotmesis (2). Neurapraxia: it is a term used to description the nerve with losing function however(3) Axonotmesis: it is a term used to description the loss of axon continuity with its myelin, without loss of sheath continuity. In these types of nerve injury, the Wallerian degeneration occurs because the perineurium and epineurium is still continuous (4) Neurotmesis: it is a term used to discretion the a second type of nerve injuries in which a loss of all sheath continuity of the nerve to be seen associated with losing the continuity of the axons and both of glial and connective tissue support the nerve. These types of nerve injuries are mostly resulted from laceration and cutting of the nerve directly

(3). Wallerian degeneration is a degenerative process which starts directly after cutting or crushing of the nerve fibers at a distal segment of nerve injury (5) though which degrading of the axons happened instantly through the axonal level (6) along with Schwann cells which is called Wallerian degeneration (7). Successful process will cause nerve regeneration (8). It is faster in the PNS, and almost complete regeneration is possible if the defects within the terminal level of the nerve, in contrary to slow recovery in the CNS. The above is because those myelin sheaths are produced by oligodendrocytes instead of Schwann cells that can stimulate the macrophages faster (9). Vitamin B12, also called cobalamin, is a water-soluble vitamin with multiple functions in organisms, vitamin B12 increased the number of Schwann cells and myelinated nerve fibres, and the diameter of axons, through which effects it can promote theregeneration of myelinated nerve fibres and the proliferation of Schwann cells [10]. In addition, vitamin B12 has shown antioxidant properties because it is also a good scavenger of reactive oxygen species and is suggested to be a good neuroprotectant. Moreover, vitamin B complex or vitamin B12 can increase the expression of brain-derived neurotrophic factor (BDNF) in injured nerves at both mRNA and protein levels, therefore promoting the regeneration and functional recovery of injured nerves through increasing BDNF expression [11]. Some authors have shown that vitamin B12 provides a basis for more beneficial treatments of nervous disorders through both systemic and local delivery of high doses of methylcobalamin to target organs, which has been shown to have the potential to treat peripheral nerve injury [11]. Inasmuch as the amount of vitamin B complex and vitamin B12 vary in cases of crush nerve injuries, it is necessary to administrate these vitamins in the acute phase of nerve injury in order to enhance nerve regeneration [12].

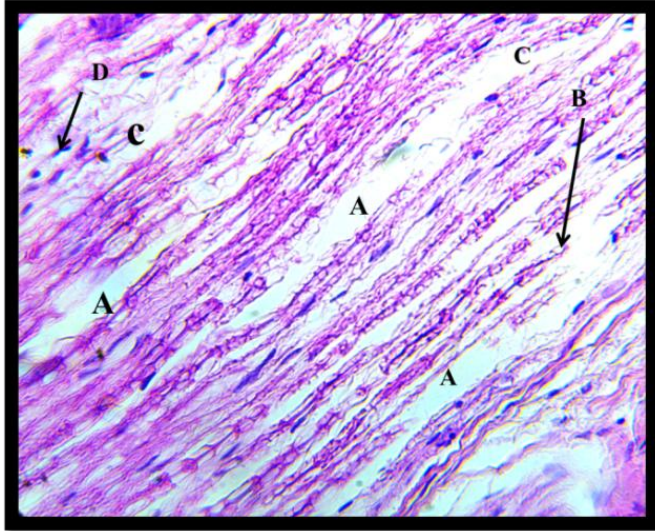
## **Material and methods**

Twelve healthy rats were used in this study which divided to two groups of 6 animals in all groups. The animals were anesthetized and exposed of the Sciatic nerve in the left side and the Sciatic nerve were transected and sutured by using the (8.0) silk 3 stitches and the suturing the muscle and the skin by the routine methods. The control group left without any addition and the treated groups were administered by drink water with vitamin B12 daily for 14 days once daily. The animals were euthanized after 14 and 28 days and the Sciatic nerve were examined by the histopathological examination in 14 and 28 days.

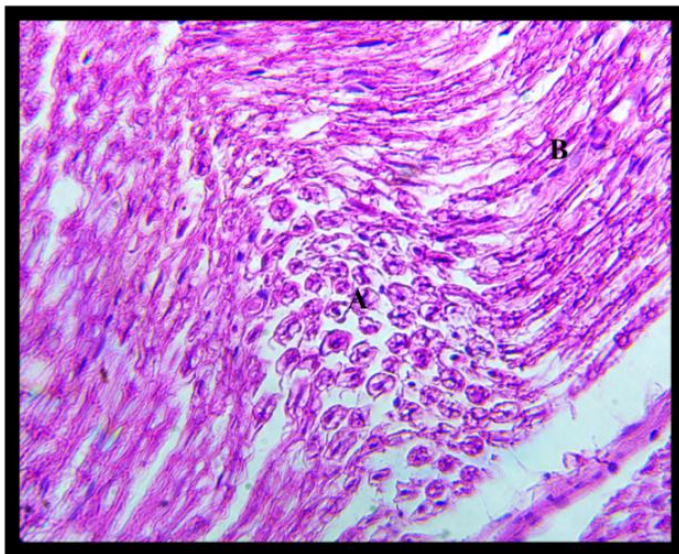
## **Statistical analysis**

GraphPad Prism 5 software (GraphPad Software Inc., La Jolla, USA) was used for analyzed data statistically for all the study.

## Result



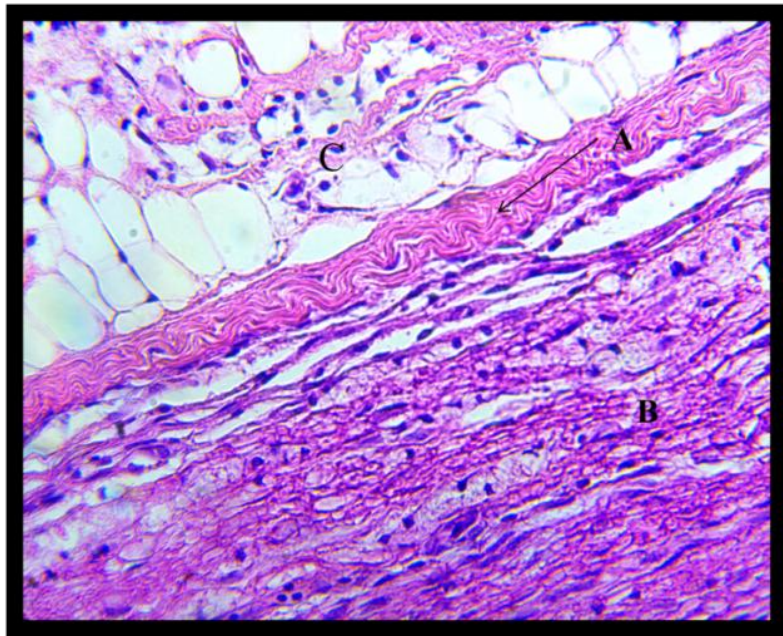
**Figure (1) The control group in 14days showed (A) the degenerative vacuoles (B) the nerve fibers (C) fragment of the nerve fibers (D) inflammatory cells (H and E x40).**



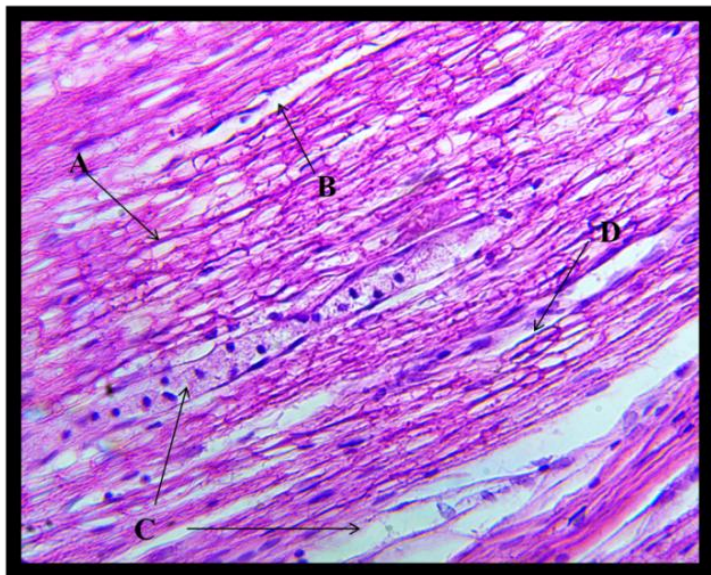
**Figure (2) The treated group in 14 days showed(A) the fragment of the nerve fibers (B) the nerve fibers (H and E x40).**

The result of the nerve histopathological examination in the 14<sup>th</sup> days showed in control group the degenerative vacuoles were present and the inflammatory cells with fragment of the nerve and an arrangement of the nerve fibers in (fig 1). The treated group in the 14<sup>th</sup> days showed the fragment of the nerve fibers and the axon of the nerve was present and the nerve fibers were arranged proximal and distal to the central of the site in (fig 2).





**The control group in 28 days showed (A) collagen fibers (B) the nerve fibers with the inflammatory cells (H and E x40).**



**The treated group in 28 days showed (A) the axon of the nerve (B) the space between the nerve fibers (C) the bungur bundles (D) nerve with Node of Ranvier (H and E x40).**

The result of the nerve in histopathological examination in 28 days in the control group showed the arranged of the nerve fibers and the inflammatory cells were present in the sit and the degenerative vacuoles present in the sit with collagen fibers in (fig 3).

The treated group showed the good arranged of the nerve and the Schwann cells with the inflammatory cells and the vacuoles loss than the control group and the axon with the node of Ranvier was present in (fig 4).

### **Dissection**

The vitamin B12 have the ability to accelerate the nerve regeneration because it proppartes to increase the Schwann cells in the nerve regeneration and the diameter of axons, and effects on the regeneration of myelinated nerve fibers and the proliferation of Schwann cells (11). In addition, vitamin B12 has shown antioxidant properties because it is also a good scavenger of reactive oxygen species and is suggested to be a good neuroprotectant.

In our study the regeneration in the treated group were good and faster comparative with the control group, because the ability of the vitamin B12 to increased and accelerate the regeneration of the nerve was very clear in the histopathological examination . this study agreed with (13) when he found the result of the treated group were best than the control group after used Dexamethasone and vitamin B12 to accelerate the nerve regeneration. (14) support our study when he found the vitamin B can faster the nerve regeneration in the diabetic rate and the treated group were best than the control group. (15) found the used of vitamin B12 was given good remyeination of the nerve and good orientation and good demyelination in the nerve after injury this study give the support to our study.

From all the last information we suggest that the vitamin B12 give the best and the good regeneration the treated group because it has the ability to incensed the Schwann cells which have the best role in the nerve degeneration and regeneration and can increased the myelineted nerve and the diameter of the myelin sheath around the axon.

### **Conclusion**

Our conclusion of this study that used of the vitamin B12 was very useful and give good result in the regeneration of the peripheral nerve and accelerated the nerve proses degeneration and regeneration.

### **Limitations and Future Studies**

This research was special exertion

### **Acknowledgement**

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