

## **Histological study for improvement of the sciatic nerve injury of the rat by administration of oil of *Nigella Sativa***

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### **Abstract**

Twenty five adult rats of about 200 gm weight were subjected to the left sciatic nerve injury by micro artery forceps for 10 second. After nerve injury, the animals were classified into five groups A, B, C, D and E, each containing five animals. All the animals were administered the oil of *Nigella sativa* in a dose of 200  $\mu$ ml. The schedule of administration was such that group A was dosed for one week, group B for two weeks, group C for one month and group D for two months successively, while group E remained as control. At the end of experimental period, the animals were sacrificed and approximately 5 mm segments of the sciatic nerves was obtained from each animal, processed for histological technique to demonstrate the effect of the oil *Nigella sativa* on the architecture of the sciatic nerve. The present results demonstrated the efficacy of the oil improved the regeneration of the nerve injury better and faster than that of the control animals and this could be interpreted as the effect of oil of *Nigella sativa* on the mediators of inflammation and their cytoprotective and antioxidant actions.

### **Introduction**

*Nigella sativa* seeds; commonly known as black seed or black cumin, are used in folk medicine all over the world for the treatment and prevention of a number of diseases and conditions that includes asthma, diarrhea and dyslipidemia (Ali and Blunden, 2003). Kanter (2008) studied the effect of *Nigella sativa* on the neuronal injury of the frontal cortex and brain stem in the rat after chronic toluene exposure, so the morphological improvement on neurodegenerative in the frontal cortex and brain stem was observed. Kazim et al. (2005) utilized oil of *Nigella sativa* for regeneration of the diabetic peripheral nerves in the rats, they revealed that there was restoration of the fatty acid composition in the nerve membrane, reducing the diabetic neuropathological changes and improving the nerve conduction velocity. The present study was designed to show the effect of oil of *Nigella sativa* on the improving the sciatic nerve injury of the rat and compare these changes or improvements with the control animals.

### **Materials and Methods**

Twenty five rats (Sprague-Dawely) of 200 gm weight per each animal were subjected to left sciatic nerve crush injury by using micro artery forceps for 10 seconds. The left lateral area of the gluteal and femoral

region which is associated with the skin incision and hamstring muscles incision, followed by the exposing and crushing of the sciatic nerve. The muscles were approximated and then sutured by catgut followed by suturing the skin with silk suture and the area of incision was sterilized with administration of systemic antibiotic. Oil of *Nigella sativa* was orally administered to the groups of the animals A, B, C, D and E groups.

Group	Number of animals	Time of administration of oil <i>Nigella sativa</i> (days)
A	5	7
B	5	14
C	5	30
D	5	60
E	5	Control-survived 60 days

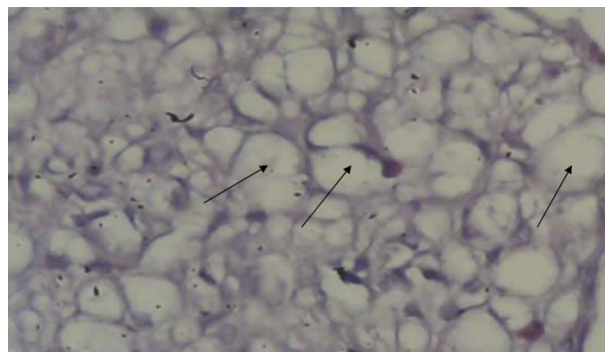
The animals were sacrificed at the end of the experimental period.

Specimens of the sciatic nerve of 5 mm length were removed from distal to the injury site and immediately fixed in the 10% of formalin and then dehydrated in graded alcohol series Cleared by xylene and infiltrated in paraffin wax according to the method of Luna (1968). The blocking of the specimens were sectioned at 6  $\mu$ m thickness by microtome and stained routinely by haematoxlin and eosin dyes for examination under light microscope.

## Results

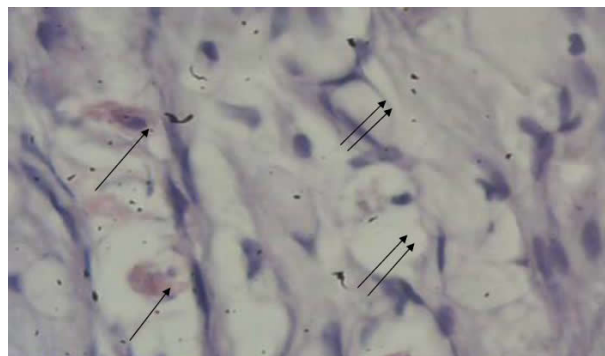
Gross observations signs of limping of the left leg of all animals were observed immediately post sciatic nerve injury and continued for the next 7 days. The animals after that appeared normal, active and showed no signs of being unwell.

Group (A) : This group was administered oil of *Nigella sativa* for successive 7 days, showing sever destruction of the nerve fibers of different sizes and the swelling of the endoneurial tubes which appeared empty from the axons. No signs of any regeneration at this stage (Fig. 1).



**Fig. 1: Demonstration the complete destruction of the nerve fiber associated with swelling of the endoneurial tube (arrow) which appeared empty from axons (H & E 400X).**

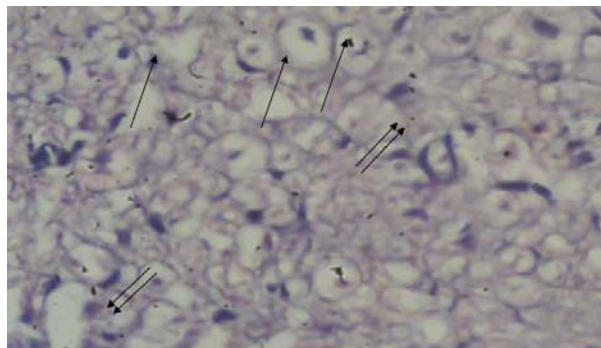
Group (B): In this group which received the oil for successive 14 days demonstrating the swelling of the endoneurial tubes associated with the presence of the Schwann cells and no signs of any regenerative process. (Fig. 2).



**Fig. 2: Indicating the presence of debris inside the endoneurial tube (single arrow) appeared swollen (double arrow) (H & E 400X).**

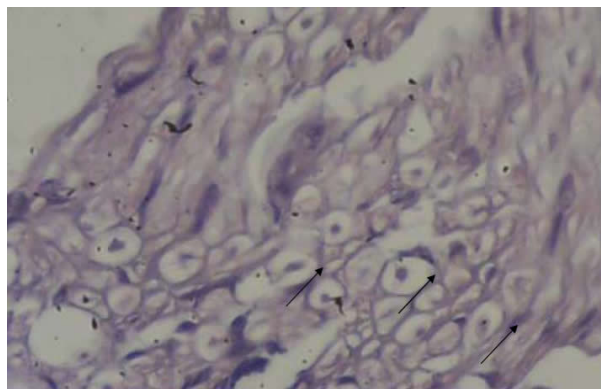
Group (C): This group administered Oil of *Nigella sativa* for 30 days successively, here there was

indication for improvement of the sciatic nerve at site of injury which is formed by the axons surrounded by thin myelin sheath with Schwann cells, however there was certain numbers of the endoneurial tubes were swollen (Fig. 3).



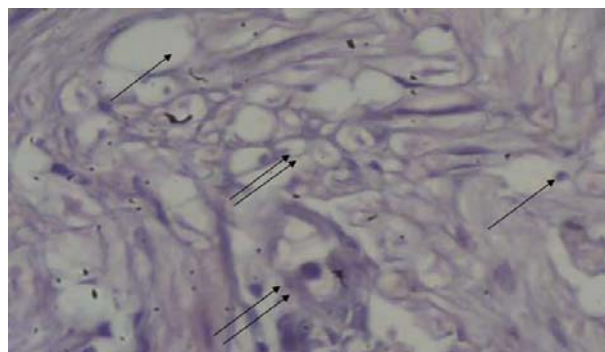
**Fig. 3: Showing the regeneration of certain nerve fiber formed by myelin sheath covering the axons (single arrow) However these is a number of endoneurial tube still devoid for axons (double arrow) - (H & E 400X).**

Group (D): The present group was exposed to administration of the oil for 60 successive days, showing useful improvement of the sciatic nerve injury reflected by increase in the number and size of the nerve fibers at the site of injury, however there was individual nerve fibers were present devoid for thick axons (Fig. 4).



**Fig. 4: Most of the axons are present surrounded by the myelin sheath (single arrow) H & E 400X).**

Group (E): The control group subjected to sciatic nerve injury. In this group there was improvement of the nerve fibers but its quantity were less in number and less in size in comparisons with the treated group of D. There were a number of still degenerated nerve fibers inside the endoneurial tubes. (Fig. 5).



**Fig. 5: present of a few numbers of the axons which appeared surrounded by myelin sheath and (single arrow) of the endoneurial tube appeared devoid for any regeneration of axons (double arrow) - (H & E 400X).**

## Discussion

In the current study, we induced sciatic nerve crush in the rat as a model for showing the regeneration of the sciatic nerve injury by utilization of the oil of *Nigella sativa*. In the context of sciatic nerve injury, several experimental diseases have been developed which may serve as a model for investigation into pathogenesis of relevant human neuropathies and their treatment (Ibrahim, 1996). Kanter (2008) used oil of *Nigella sativa* in rat and showed its protective effects against neuronal injury of the frontal cortex and brain stem. His study indicated improvement of neurodegeneration of the frontal cortex and brain stem, and concluded that therapy causes morphological improvement of neurodegeneration; on the other hand, improvement of the diabetic peripheral nerve injury in the rat by administration of *Nigella sativa* was reported by Kazim et al. (2005). The present study, also demonstrated improvement of the sciatic nerve in comparison with

the control group which agree with the results of the Beuch and Friede (1984) who reported the regeneration of the injured peripheral nerves after three months, while in the present study, healing started within one month. Ali and Blunder (2003) attributed the beneficial effect of the oil of *Nigella sativa* to their cycloprotective and antioxidants action and to their effect on some mediators of inflammation. This interpretation could be correlated with present study; that the oil of *Nigella sativa* could inhibit the inflammation at the site of injury, so enhance the possibility of the growth of new nerve fibers (neurites) at the site of injury.

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