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USE OF OMENTUM BIOSCAFFOLD FOR REGENERATION OF SCIATIC NERVE DEFECT IN DOGS

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Abstract

The study has done on (10) adult healthy male dogs divided in two groups (control group and group treated with omentum bioscaffold) each group had (5 dogs). The study were started in February 2020 extended about 5 months. The operation was made by exposing the sciatic nerve on the left side of thigh through a caudo-lateral skin incision (5-8 cm in length) Make incision in the left flank of dogs then make grooves under the skin to the nerve, make flap of omentum and insert inter the grooves until the nerves then suturing the omentum then suturing the muscles (0.2 catgut) and finely the skin (0.2 silk). The results that animals showed the muscle flexion was flaccid from the first days after treatment and then progressively disappeared and return near normal on 60th day. The histopathological examination of the distal longitudinal section of the nerve showed few number of Schwann cells with remylination of nerve fibers and few vacuolated degenerated nerve The study conclude that it is possible to treat the sciatic nerve damages with good possible results using omentum bioscaffold shield as a one ways that used in ligation of damaged nerve.

Key words : Sciatic nerve, nerve defect, omentum group treated bioscaffold regeneration.

Introduction

Peripheral nerve energy is one of the serious problem in the medical field because of the highest important function of movement, there are many trails to regenerate the damaged nerves especially large nerve without sacrificing a healthy nerve to obtain the nerve auto graft. Many extensive research efforts have been made in the field of neural tissue regeneration. Till now, most of the studies have been performed mainly to optimizing the microstructure of nerve scaffolds, or introducing neuro tropic agents and seeding supportive cells (Ranjan *et al.,* 2015). It has been reported that insufficient vascularization of nerve scaffolds is among the main factors which limit the performance of nerve scaffolds in promoting nerve regeneration. Peripheral nerve injury (PNI) has a relatively high prevalence causing socio-economic impacts that represents a serious problem to society (Rodri *et al.,* 2004). Also traumatic peripheral nerve injuries are common in companion animals due to trauma, iatrogenic lesions, and surgical misadventure.

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Sciatic nerve in general is generate from spinal cord from the anterior and posterior divisions of (L4, L5, S1 and S2 spinal nerves) and the anterior division of the (S3 spinal nerve), In dogs and cat sciatic nerve injuries are common and may cause temporary or permanent neurological damage, therefore sciatic nerve injury represents the most frequently encountered peripheral nerve injury due to important role of this nerve in motion and weight bearing limb specially in dogs and cats, a poor prognosis for recovery may be observed in many cases (Mortari *et al.,* 2018). Different animal models have been established to study the regenerative capacity of the peripheral nerve using various therapeutic agents (Mishra and Stringer, 2010). One of the trails to make nerve healing is the omental transposition which has been demonstrated to be beneficial in the surgical treatment of neurological injuries, it is reported that the omentum is commonly found wrapped around areas of infection and injury, it has well known properties to constrain the spread of intra-peritoneal infections by moving to the infection site and isolating it from the nearby healthy areas (Nicola, 2019) the study aimed to using a new methods in sciatic nerve regeneration. Furthermore, charting the regeneration of nerve histopathologically.

Materials and Methods

1. Animals of study

The study has done on (10) adult healthy male dogs separated as two group (control group and group treated with omentum bioscaffold) each group had (5 dogs), with body weight ranged between (15-20 kg). The animals of study were kept in animals House College of veterinary medicine –University of Basra in a cages along the period of study, good nutrition and management had been provided to the animals. The study were started in February 2020 extended about 5 months.

2. Animal Preparation

As pre surgical procedures the dogs fasted from food and water for 12hr before the operation. clipping and shaving the site of operation have been done carefully before operation then given a mixture of xylazine hydrochloride 5 mg/kg B.W. intra muscular as tranquilizer and ketamine hydrochloride 15 mg/kg B.W. intramuscularly as a general anesthesia.

3. Surgical procedures

The operation was made by exposing the sciatic nerve on the left side of thigh through a caudo-lateral skin incision (5-8 cm in length) incision parallel and behind the femur bone and separating it bluntly from the biceps femorus muscle cranially and semitendinosus muscles caudally by curved artery forceps (Fig.1). The sciatic nerve was exteriorized through the wound site (Fig. 2) (Chamorro *et al*.,1993). The nerve was subjected to crush injury with the help of a curved hemostatic forceps (jaw width 3 mm) (Mortari *et al.,* 2018). The strength used for compression was standardized at the second locking position of the haemostatic forceps for 60 seconds. The site of the crush injury was the intermediate region of the sciatic nerve in its course down the thigh region before bifurcation into the tibial and peroneal nerves (Garcia *et al.,* 2005). The muscles and subcutaneous fascia is closed with 3/0 cat gut suture (simple continuous), and finally the skin is closed with 3/0 silk suture. Furthermore, the animals were given systemic cefixime 500mg /day intra muscular once daily for 5 days post operation.

Fig. 1

4. Using of omentum bioscaf fold for regeneration sciatic nerve

Make incision in the left flank of dogs then make grooves under the skin to the nerve, make flap of omentum and insert inter the grooves until the nerves then suturing the omentum then suturing the muscles (0.2 catgut) and finely the skin (0.2 silk).

5. Post operative histopathology

Taken the microscopic examination of nerve sections to determine the number of Schwann cells, arrangement of nerve fibers, vacuolated degenerative nerve fibers intra neural and extra neural scarring,, the axonal alignment and density of nerve fibers. The Neuro histopathological examinations were done with stain (eosin stain and hematoxylin). Separated The left sciatic nerves from each animal and then nerve samples fixed the nerve sample on to plastic plate using stay sutures to keep the nerve

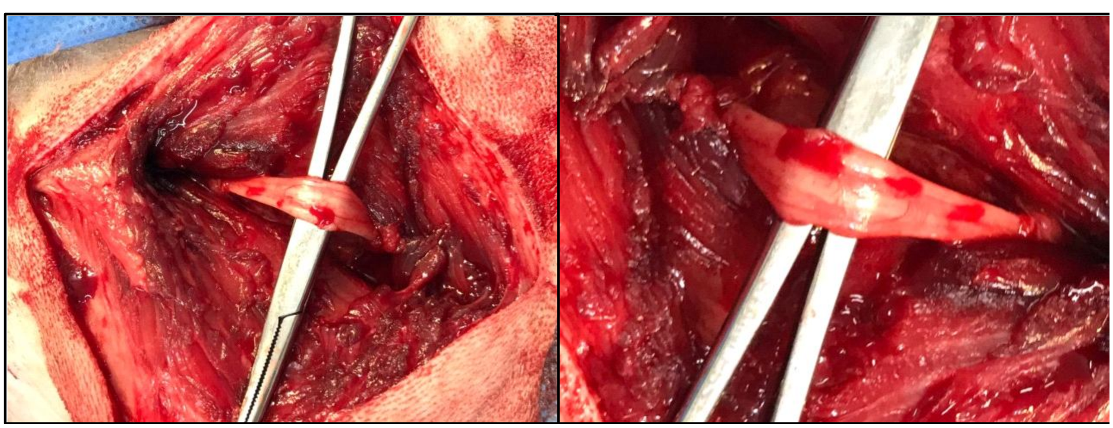

Fig. 2 : The sciatic nerve was exteriorized through the wound site (behind the Fig: (2)

tissues straight then saved in special container containing 10% formalin. Three samples of 1-cm length each were harvested from the proximal, middle (site of injury) and distal portions of the sciatic nerve.

Results

Clinical Finding

Control Group

In this group of animals showed sever pain, swelling and knelling on the left leg after treatment then become moderate (pine and swelling) after 21 days, at the 28 day (A,T) was become normal. The animals show sever knolling after treatment, Then become moderate after 42 day and disappear in 60 day (A.T). At the first day (A.T.) was showed flaccid of the muscle flexion and the become less gradually then become normally at 90 day.

Omentum Group

The left legs was also showed knelling, pain, swelling at the 7th days (AT). Found severe knuckling from first day to the 21th (A.T), then became knelling less at 35th and then disappeared at 42 days (A.T). In this groups of animals showed the muscle flexion was flaccid from the first days (A.T) and then progressively disappeared and return near normal on 60th day (A.T)

Histopathological Examination

Control Group

The histopathological examination of longitudinal section of the proximal part of left sciatic nerve at 3 month necrotic- degenerated nerve fibers (Fig. 3). Was showed changes at middle transaction part of sciatic nerve, irregular and degenerated myelin sheath, and presence of vacuolated degenerated nerve fibers associated with Schwann cells (Fig. 6). The distal longitudinal section of distal part of nerve sections showed Irregular arrangement of nerve fibers and presence of few vacuolated degenerated nerve fibers (Fig. 4).

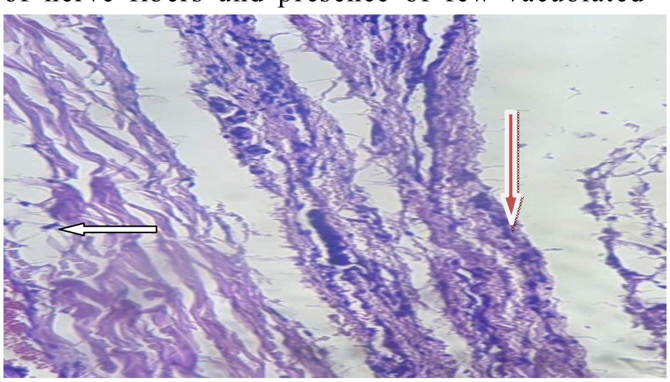

Fig. 3: The proximal longitudinal section of sciatic nerve at 3 months (A.T) of control group showed irregular Schwann cells (⇐) necrotic- degenerated nerve fibers (→) (H&E 40X).

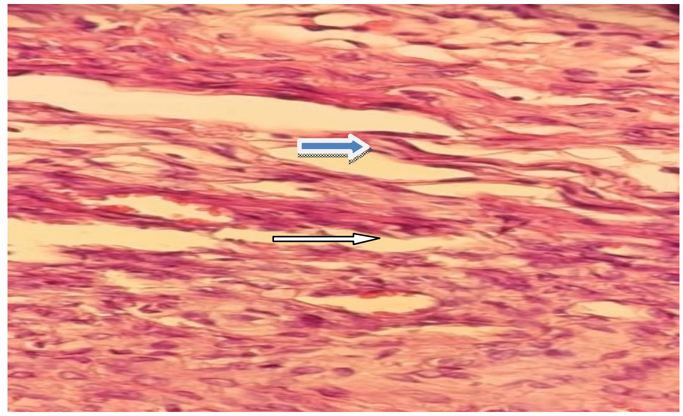

Fig. 4: The distal longitudinal section of sciatic nerve of control group Irregular arrangement of nerve fibers (⇒) and presence of few vacuolated degenerated nerve fibers (⇒) (H&E 40X).

Omentum Group

The histopathological examination of longitudinal section of the proximal part of sciatic nerve at 3 months showed Regular arrangement of nerve fibers. Normal looking of Schwann cells without vacuolated degenerated nerve fibers (Fig. 5). The histopathological examination of the middle transverse part of the nerve showed good orientation of regenerated nerve fibers with moderate reduction of degenerate vacuolated nerve fibers and was showed very few degenerated nerve fibers and appeared increase number of Schwann cells (Fig. 6). The histopathological examination of the distal longitudinal section of the nerve showed few number of Schwann cells with remylination of nerve fibers and few vacuolated degenerated nerve fibers (Fig. 7).

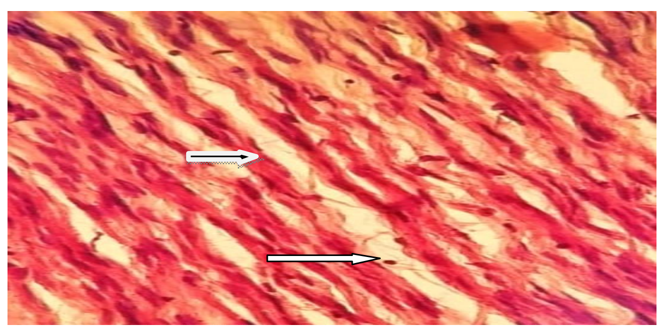

Fig. 5: The proximal longitudinal section of sciatic nerve of omentum group.
(⇒) Regular arrangement of nerve fibers. Normal looking of Schwann cells without vacuolated degenerated nerve fibers (⇒) (H&E 40X).

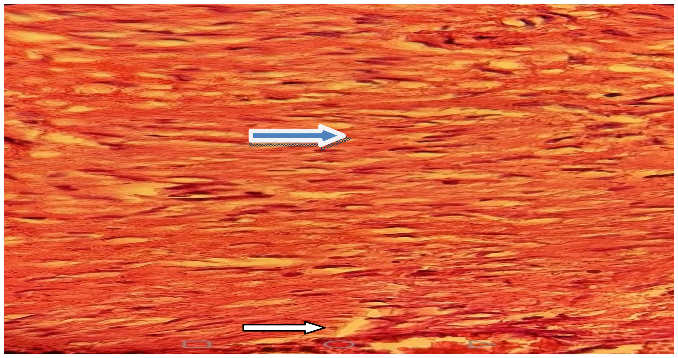

Fig. 6: The transverse section of middle part of sciatic nerve of omentum group Good orientation of regenerated nerve fibers (→) and moderate reduction of degenerate vacuolated nerve fibers, very few degenerated nerve fibers (⇨) (H&E 40X).

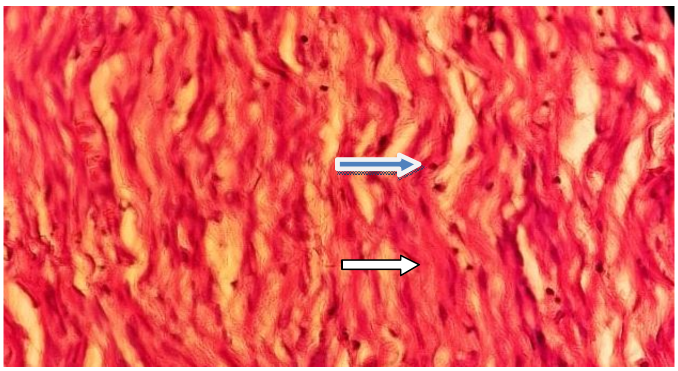

Fig. 7: The distal longitudinal section of sciatic nerve of omentum group few number of Schwann cells (→) remylination of nerve fibers and few vacuolated degenerated nerve fibers (⇨) (H&E 40X).

Discussions

Left legs after regeneration using omentum showed knelling, pain, swelling at the 7th days post operation, with severe knuckling from first day to the 21th of treatment, the result was not agreed with (Chamorro *et al.,* 1993) when they reported that Percentage of axons and blood vessels in the nerve grafts after 30 days,

The result was not agreed with (Castan, and Kinne, 2002) when they reported that omental graft bridging results in an improved rate and extent of functional nerve recovery in time of (8 weeks). The result of histopathological examination of the middle transverse part of the nerve showed good orientation of regenerated nerve fibers with moderate reduction of degenerate vacuolated nerve fibers and was showed very few degenerated nerve fibers and appeared increase number of Schwann cells, the result was agreed with (Khashjoori, 2012) when they reported that in the group that transected sciatic nerve with the omentum, the degeneration and vacuolation of nerve fibers was far less than without omentum.

Conclusion

In conclusion it indicated that omentum flap was less degenerated vacuolated nerve fibers also associated with regeneration of nerve fibers therefore, the study conclude that it is possible to treat the sciatic nerve damages with good possible results using omentum bioscaffold shield as a one ways that used in ligation of damaged nerve.

References

Castan, F. and R. Kinne (2002). Omental graft improves functional recovery of transacted peripheral nerve. *J. Muscle Nerve*, **26:** 527–532.

Chamorro, M., F. Carceller, C. Llanos, A. Rodriguez-Alvarifio, C. Colmenero and M. Burgueiio (1993). The effect of omental wrapping on nerve graft regeneration. *British J. of Plastic Surg*., **(46):** 426-429.

Garcia, G., H.S. Goldsmith, J. Angulo, A. Prados, P. LopezHervas, B. Cuevas, M. Dujovny and P. Cuevas (2005). Angiogenic capacity of human omental stem cells. *Neurol Res*., **27(8):** 807–811.

Khashjoori, B.K. (2012). Study the effect of the omental pedicle flap in sciatic nerve healing AL-Qadisiya. *Journal of Vet. Med. Sci.*, **11(2):** 8-16.

Mishra, P. and M.D. Stringer (2010). Sciatic nerve injury from intramuscular injection: a persistent and global problem. *Int. J. Clin. Pract*., **64(11):** 1573–1579.

Mortari Ana, C., Q.J. Gomes, B.C. ValériaSeullner and R.S. Canevese (2018). Sciatic Nerve Injection Palsy in a Dog: Electro-diagnostic Testing and Microsurgical Treatment. *Acta Sci. Vet.*, **46(1):** 284.

Nicola, V.D. (2019). Omentum a powerful biological source in regenerative surgery. *J. Regenerative Therapy*, **11:** 182-191.

Ranjan, P., P.M. Mazumder, R. Parmaguru, D. Sasmal, R.K. Sinha, Y. Aggarwal and J. Das (2015). Effect of ethyl acetate fraction of the aerial parts of salvia splendens, Sellow ex Roem. And Schult on Diabetic Neuropathy. *Pharmaco.,* **6:** 313–323.

Rodrý,´ F.J., A. Valero-Cabre and X. Navarro (2004). Regeneration and functional recovery following peripheral nerve injury. *Drug Dis. Disease Mod. J.*, **1:** 177–185.