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Ultrastructural Evaluation of the Planter Nerve after Transection of the Ramus Commuincans in the Horse.

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The clinical significance of the *ramus communicans*, which connects the medial and lateral palmar/plantar nerves, should be determined to avoid errors in interpreting the effects of diagnostic anesthesia of the palmar/plantar nerves of horses during lameness examination. To determine its clinical significance, the *ramus communicans* of the pelvic limbs of 2 ponies was transected. Two months later, samples of the plantar nerves were collected proximal and distal to the communicating ramus, processed and examined ultrastructurally to determine if transection of the *ramus communicans* caused axonal Wallerian degeneration of portions of the medial and lateral plantar nerves.

A relevant literature review revealed a large number of articles written about nerve degeneration, including Wallerian degeneration in various species [1, 2, 3, 4]. No information, however, was found regarding Wallerian degeneration in the horse nerves. Several studies have documented the power of EM to assess ultrastructure morphology [6, 7, 8].

The limited resolution of light microscopy misses many important details of nerve structure. Understanding the morphological changes that occur in damaged or diseased peripheral nerves has been enhanced by the use of electron microscopy. The ultrastructure of the palmar digital nerve of equine limb has been examined by electron microscopy [9].

Myelin tongues extending from the major line of the inner myelin sheath contained vacuoles with electron-dense irregular myelin layers (Figure 1). The axoplasm contained ruptured mitochondrial cristae, myelinated figures, and various sizes of vacuoles. Irregular myelin sheaths contain myelin balloons of multiple whorls and vacuoles of various sizes were in its split axonal myelin sheath layers (Figure 2). Degenerating myelinated axons were characterized by loss or shrinkage of irregular axoplasm and subsequent myelin breakdown at both levels of the planter proximal and distal portions of the nerve, (Figures 1, 2). Shrunken, irregular axoplasms were detected in these degenerating axons with prominent axoplasmic vacuoles and myelin whorls in the axoplasm (Figure 1). The axoplasm was shrunken and contained ruptured mitochondria, whorls of myelin layers and vacuoles. (Figures 1, 2).

Based on results of electron microscopic examination of the ultrastructure of the *ramus communicans* of equine pelvic limb, we conclude that *the ramus communicans*, sends sensory fibers from the lateral plantar nerve to the medial plantar nerve and from the medial plantar nerve to lateral plantar nerve.

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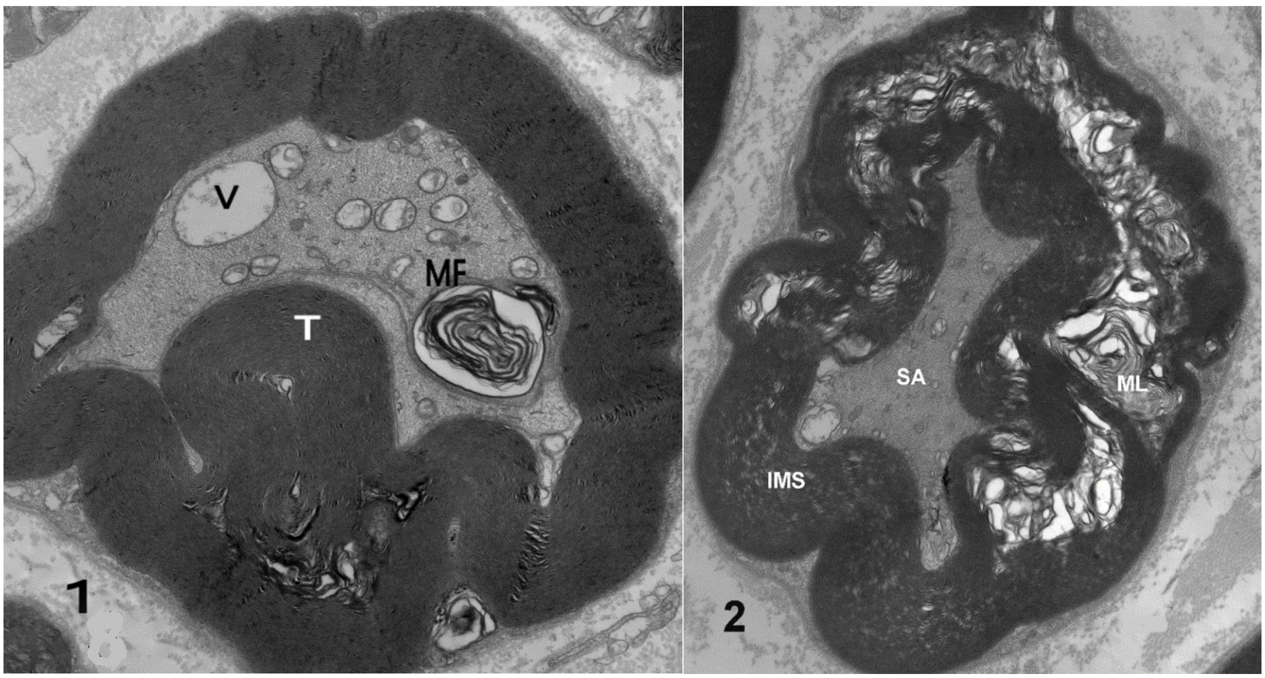

Figure 1. Lateral planter nerve, sectioned distal to the communicating branch showing a condensed, irregular myelin sheath with tongues (T) of deteriorating myelinated structure extending into the axoplasm. Multiple ruptured mitochondria cristae and myelin figure (MF) in the axoplasm indicate Wallerian degeneration. The irregular axon shows rupture mitochondria and vacuoles (V).
Scale bar: 500 nanometer. X 20000. Stained with uranyl acetate and lead citrate.

Figure 2. Lateral plantar nerve, section proximal to the communicating branch showing irregular Wallerian degeneration of most of the myelin sheath. The rest of this nerve demonstrates an irregular myelin sheath (IMS), occupied by various whorls of myelin loops, (ML) with gaps between the separated layers of myelin, indicating Wallerian degeneration. The shrunken axons (SA) of both figures show irregular myelin sheath ruptured mitochondria and various sizes vacuoles.
Scale bar: 2 microns X 1000. Stained with uranyl acetate and lead citrate.

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