

Study of morphological changes in the proximal third of the suspensory ligament of the pelvic limbs of horses after neurectomy of the deep branch of the lateral plantar nerve

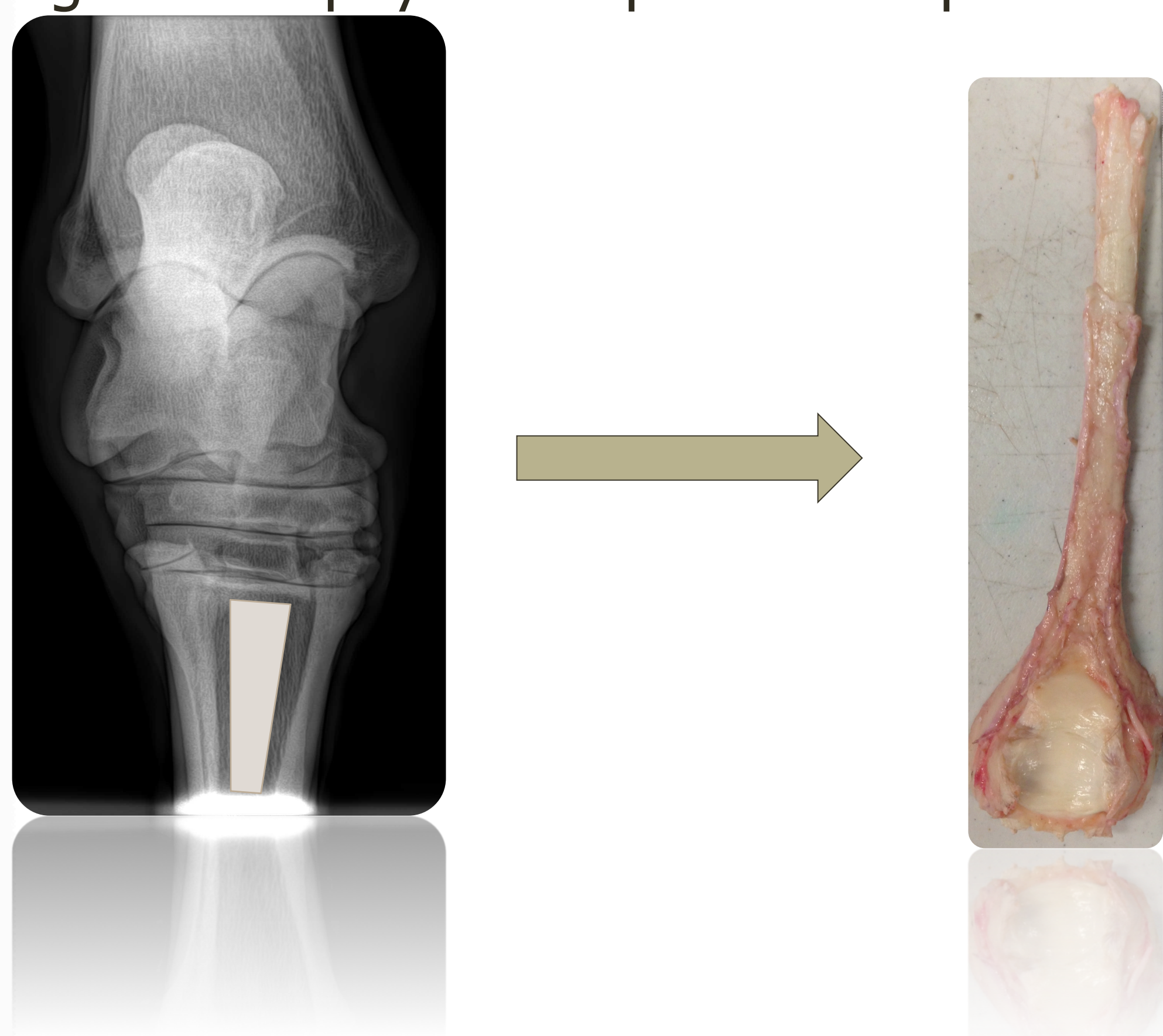
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INTRODUCTION:

Neurectomy of DBLPIN, has become a commonly performed procedure for treatment of horses lameness caused by chronic proximal suspensory desmitis^{1,2} because it relieves pain in the SL and because it eliminates neuropathic pain associated with desmitis of the ligament caused by compression of the DBLPIN between the SL and the deep fascia confining the SL in a canal bounded by the plantar aspect of the third metatarsal bone and the axial borders of the second and fourth metatarsal bones.¹

The SL of the pelvic limb contains varying amounts of muscle fibers,³ and receives sensory and motor innervation from the deep branch of the lateral plantar nerve^{1,4}. The aim of this study was to confirm, that neurectomy of the DBLPIN causes neurogenic atrophy of the proximal aspect of the SL.⁴



MATERIALS AND METHODS:

The control group consisted of 5 sound, healthy, mixed-breed horses, and the treatment group consisted of 5 sound, healthy horses that had undergone neurectomy of the DBLPIN of both pelvic limbs 4 months previously. The SLs of the pelvic limbs were harvested and the following dimensions were measured with ruler: 1. the length of the SL from the proximal aspect of the origin of the ligament to the ligament's attachment on the proximal sesamoid bones; 2. the length of the SL from the origin of the ligament to ligament's point of bifurcation; 3. and the length of each branch.

Five, 0.5-cm long slabs were harvested from each SL. The medial-lateral (width) and the dorsoplantar (thickness) dimension of each slab was measured by using a Vernier caliper. The slabs were immersed in 10% buffered formalin for 24 hrs, placed in phosphate-buffered solution for another 24 hrs, and embedded in paraffin wax. A 4- μ m section was cut from each of the 0.5-cm slabs and stained with Masson's trichrome.

Three areas containing a high concentration of muscle fibers were photographed, and the photographs were examined at 40x magnification. The mean cross-sectional area of muscle fibers in each photograph was calculated by using imaging software.

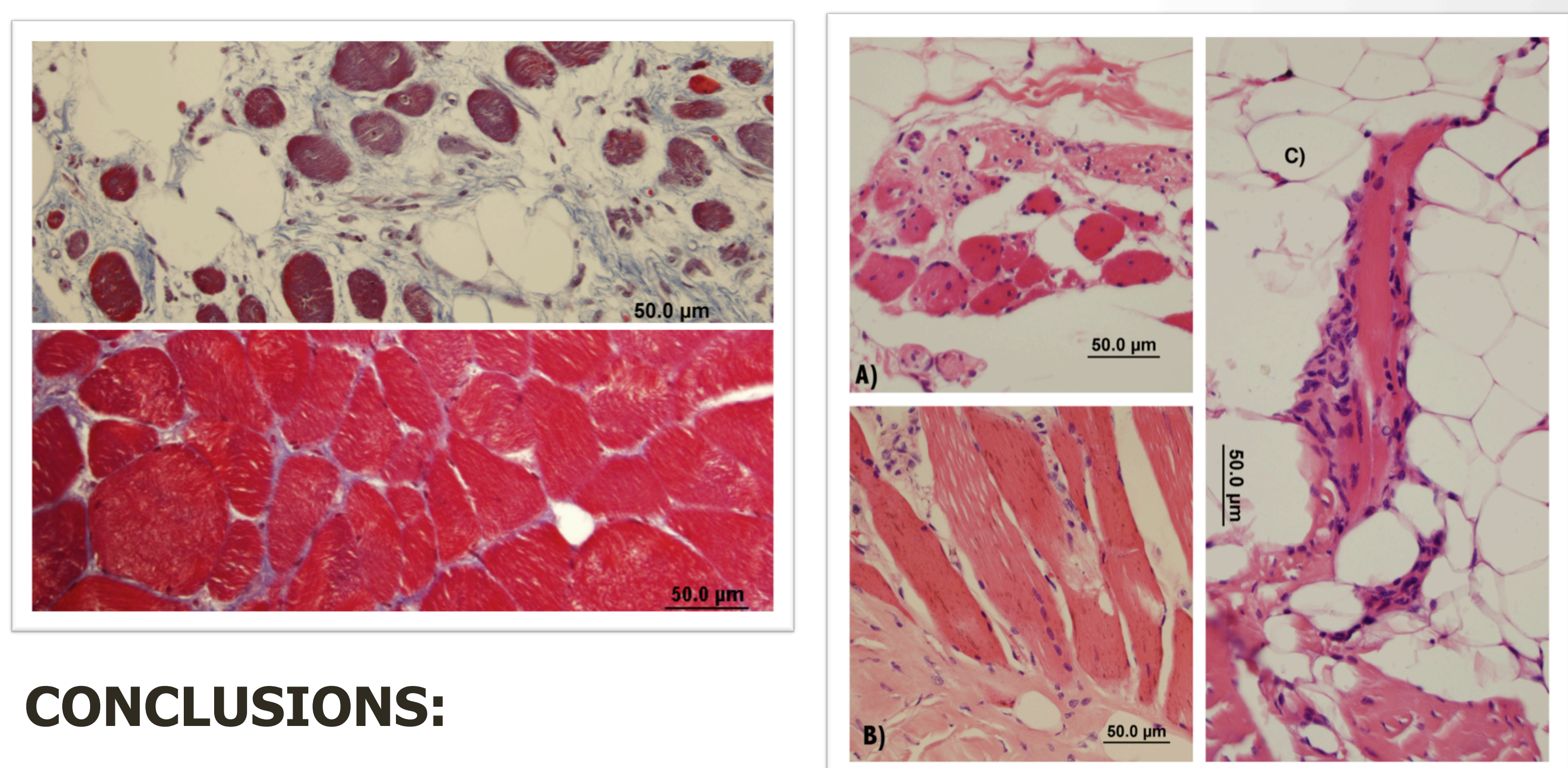
RESULTS:

There was no statistically significant difference between the mean of the length from the origin to the proximal sesamoid bones ($p = 0.674$), the mean of the length from the origin to the bifurcation ($p = 0.6754$), and the mean of the length of the branches ($p = 0.4332$) of the neurectomized SLs and the means of those measurement of the non-neurectomized SLs.

The mean width and the mean thickness of the neurectomized SLs differed significantly [$p < 0.001$ (width) and $p < 0.0011$ (thickness)] from the mean width and the mean thickness of the non-neurectomized SLs.

The mean area of muscle fibers in the neurectomized SLs differed significantly from the mean area of muscle fibers in the non-neurectomized SLs ($p < 0.0001$).

Muscle fibers in the neurectomized SLs were atrophied and varied greatly in diameter. Characteristics typical of muscle atrophy that were observed included necrotic muscle fibers; ringed and whorled muscle fibers; muscle fibers with nuclei located centrally (A), rather than peripherally, as in a normal muscle fiber (A); nuclear rowing (B); clusters of nuclei; infiltration of the ligament with fat and connective tissue; and fibrosis of the endomysium and perimysium (C).



CONCLUSIONS:

Loss of motor neuronal input to the proximal aspect of the SL results in muscular atrophy. The neurectomized ligaments were smaller in width and thickness, as determined by using a caliper, than the non-neurectomized ligaments. Substantial histological abnormalities, including atrophy of muscle fibers, were observed in the neurectomized ligaments.

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