INTRINSIC FIBER CHARACTERISTICS OF NERVUS LARYNGEOUS RECURRENS (RLN) CORRELATING TO SENSITIVITY AT TENSION STRESS

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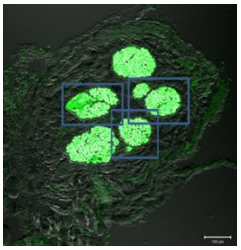
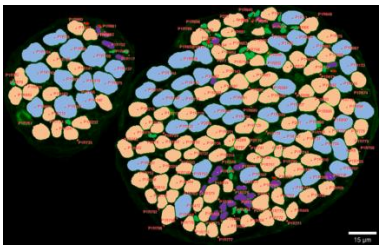
Recurrent laryngeal nerve (RLN) palsies are a severe complication of tyroid surgery in humans and different susceptibilities of individual nerves are difficult to judge for the surgeon. Therefore, this study was set to investigate intrinsic anatomical parameters of RLN and find possible relationships to nerve sensitivity characteristics in experimental simulation of thyroid surgery stress situation in pigs as a model system. The continuous intraoperative neuro-monitoring (c-IONM, Lamade et al. 2000, 2007) was applied during a tension stress experiment to characterize tension stress sensitivity. A tensile stress with a force of 1.2 N was applied until 85% of the initial IONM signal was lost and recovery of the nerve conductance signal was monitored for further 60 min after the released tension. This measurement revealed a clear differentiation of tension stress sensitivity for individual nerves within animals (Lamade et al. 2016). After the experiment all animals were sacrificed and both RLN had been fixed and processed for cryo-sectioning. Two sets of parameters were assessed by 3D confocal imaging. For a total of 12 animals the gross nerve morphology including epineurium areas, total fascicle area and numbers and mechanical distortion of nerve composition was measured (Lamade et al. 2016). From a subset of 5 animals the detailed analysis of fiber numbers, and fiber areas for all myelinated axons were considered additionally. Nerves were categorized as sensitive or robust according to the time until 85% of change of signal (COS) were measured. Any mechanical distortion of nerve structure had been avoided with this experimental setup. The gross morphology of nerves showed a wide variation for epineurium and fascicle areas between animals and individual nerves, but no clear correlation to sensitivity characteristics was measured as COS. However, the fiber characteristics (total fiber numbers, fiber area) showed a high variation combined with a significant segregation between robust and sensitive nerves. Especially the proportion of thicker axons to the total number of myelinated fibers was higher in more sensitive RLN. Further experiments will investigate correlative parameters indicating these anatomical data in the living animal.

A:  B: 

A: Total RLN with neuromyelin staining , B: Two fascicles with myelinated fibers colour coded according to size classes after image analysis with Image Pro Premier 9.2

References

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