Long term denervated striated skeletal muscle and fat cells invasion

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There are several differences between red and white muscles submitted to different experimental conditions, especially following denervation: a) denervation atrophy is more pronounced in red than white muscles; b) the size of the fibers in the red muscles does not vary between different parts of the muscle before and after denervation, if compared to white muscles; c) the regional difference in the white muscles initially more pronounced after denervation than red muscle; d) red muscle fibers and fibers of the deep white muscle present degenerative changes such as disordered myofibrils and sarcolemmal folds after long-term denervation; e) myotube-like fibers with central nuclei occur in the red muscle more rapidly than white after denervation. Denervation of skeletal muscles causes, in addition to fibres atrophy, loss of fibers with subsequent regeneration, but the extent of fat cell percentage invasion is currently unknown. Wistar rats of 200 g body weight were used. The sciatic nerve was cut at mid-thigh level and a 5-10 mm long segment of the nerve was excised. They were killed after 7, 10, 15, 27 and 32 weeks post-surgery and perfused, via the abdominal aorta, with Ringer solution. The denervated and contralateral soleus (red) and extensor digitorum longus (EDL) (white) muscles were excised, postfixed with 1% osmium tetroxide and embedded in epoxy resin for light microscopy. Sections (1-3 ìm thick) through the centre of each muscle were cut with dry glass knives, stained with paraphenylenediamine (ppd) and viewed with phase optics. The fat cell invasion was measured using a software image analyser system. The results were expressed as means ± SEM (occupied by fat cells) and subjected to statistical analysis. The criterion of statistical significance was set at $p < 0.05$. As revealed by the paraphenylenediamine technique, the soleus and EDL normal muscles present a heterogeneous population of fibres. Both muscles contained small fibres inside some fascicles, but were not characterized “metabolic group”. Generally the number of capillaries around each muscle fiber was larger in the soleus muscle, compared to the in full EDL muscle. Spindles with 3 to 5 myofibers were present in normal muscles. On the other hand, in both denervated muscles, an increase number of myofibres (6 to 8) was present inside the muscle spindles. After denervation atrophy was more pronounced in the soleus muscle than in the in full EDL muscle. Also, fat cell invasion starts earliest in soleus muscle. Only after 15 weeks could significant number of fat cells could be seen in the EDL muscle. The fat cell invasion starts immediately after denervation in soleus muscle. The statistical analysis demonstrates a significant difference between the two experimental groups, but the fat cell invasion percentage increased in both muscles with the time.