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Comparison of Gestational Diabetes Influence on the Ultrastructure of Rectus Abdominis Muscle in Women and Rats

Authors : Giovana Vesentini, Fernanda Piculo, Gabriela Marini, Debora Damasceno, Angelica Barbosa, Selma Martheus, Marilza Rudge

Abstract : Problem statement: Skeletal muscle is highly adaptable, muscle fiber composition and size can respond to a variety of stimuli, such physiologic, as pregnancy, and metabolic abnormalities, as Diabetes mellitus. This study aimed to analyze the effects of pregnancy-associated diabetes on the rectus abdominis muscle (RA), and to compare this changes in rats and women. Methods: Female Wistar rats were maintained under controlled conditions and distributed in Pregnant (P) and Long-term mild pregnant diabetic (LTMd) (n=3 r/group). Diabetes in rats was induced by streptozotocin (100mg/Kg, sc) on the first day of life, for a hyperglycemic state between 120-300 mg/dL in adult life. Female rats were mated overnight, at day 21 of pregnancy were anesthetized, and killed for the harvesting of maternal RA. Pregnant women who attended the Diabetes Prenatal Care Clinic of Botucatu Medical School were distributed in Pregnant non-diabetic (Pnd) and Gestational Diabetic (GDM) (n=3 w/group). The diagnosis of GDM was established according to ADA's criteria (2016). The harvesting of RA was during the cesarean section. Transversal cross-sections of the RA of both women and rats were analyzed by transmission electron microscopy. All procedures were approved by the Ethics Committee on Animal Experiments of the Botucatu Medical School (Protocol Number 1003/2013) and by the Botucatu Medical School Ethical Committee for Human Research in Medical Sciences (CAAE: 41570815.0.0000.5411). Results: The photomicrographs of the RA of rats revealed disorganized Z lines, thinning sarcomeres, and a usual quantity of intermyofibrillar mitochondria in the P group. The LTMd group showed swollen sarcoplasmic reticulum, dilated T tubes and areas with sarcomere disruption. The ultrastructural analysis of Pnd non-diabetic women in the RA showed well-organized myofibrils forming intact sarcomeres, organized Z lines and a normal distribution of intermyofibrillar mitochondria. The GDM group revealed increase in intermyofibrillar mitochondria, areas with sarcomere disruption and increased lipid droplets. Conclusion: Pregnancy and diabetes induce adaptations in the ultrastructure of the rectus abdominis muscle for both women and rats, changing the architectural design of these tissues. However, in rats these changes are more severe maybe because, besides the high blood glucose levels, the quadrupedal animal may suffer an excessive mechanical tension during pregnancy by gravity. Probably, these findings may suggest that these alterations are a risk factor that contributes to the development of muscle dysfunction in women with GDM and may motivate treatment strategies in these patients.

Keywords : gestational diabetes, muscle dysfunction, pregnancy, rectus abdominis
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