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## THE IMPACT OF CHRONIC PSYCHOLOGICAL STRESS AND DIABETES ON CARDIAC MORPHOLOGY IN RATS

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**Background and aim.** Type 1 Diabetes (T1DM) is strongly associated with cardiovascular complications, including hypertension, coronary artery disease, and cardiomyopathy. Chronic psychological stress is also recognized as a contributing factor to both metabolic and cardiovascular dysfunction. The aim of this study was to evaluate the combined and individual effects of T1DM and chronic psychological stress on cardiac tissue morphology.

**Methods.** Four experimental groups were established: Control (n=9), Stress (n=9), T1DM (n=7), and T1DM+Stress (n=8). Chronic psychological stress was induced using a 28-day restraint stress protocol. T1DM was induced using Streptozotocin (65 mg/kg). On day 29, animals were anesthetized, the hearts were removed, and used for histological analysis (H&E staining). Cardiac tissue sections were evaluated using the software QuPath (0.4.4). A total of 1650 longitudinally cut cardiomyocytes were measured. Statistical analysis was performed using MS Excel.

**Results.** The smallest mean cardiomyocyte size was observed in the Control group (17  $\mu\text{m}$ ), whereas the largest was in the T1DM+Stress group (22.45  $\mu\text{m}$ ), which shows the most pronounced hypertrophic response. Both the Stress (20.25  $\mu\text{m}$ ) and T1DM (21.86  $\mu\text{m}$ ) groups demonstrated intermediate increases in cardiomyocyte size compared to the Control group, with the T1DM group showing a greater increase than the Stress group alone. Statistical analysis revealed that the differences in cardiomyocyte size between all groups were highly significant ( $p < 0.001$ ).

**Conclusions.** The increase in cardiomyocyte size in both the Stress and T1DM groups indicates that each condition alone is sufficient to trigger myocardial hypertrophy. Since the T1DM group showed larger cardiomyocytes than the Stress group, diabetes appears to have a more pronounced impact on cardiac remodeling. The T1DM+Stress group demonstrated the highest cardiomyocyte size, suggesting that chronic stress exacerbates diabetes-induced cardiac damage. This may indicate additive or even synergistic pathological mechanisms.

**Keywords.** Psychological stress; Type 1 diabetes mellitus; cardiomyocytes; cardiac morphology.