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Effects of Experimental Diabetes and Insulin Treatment on Rabbit Renal Morphology: A Quantitative and Qualitative Study

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Abstract: Diabetes causes metabolic defects and related vascular alterations such as atherosclerosis. These vascular alterations may also reflect the renal structural degeneration under the influence of diabetes. Therefore, the aim of the present study was to determine qualitatively and quantitatively the effect of experimental diabetes on rabbit renal cortical structure, and also to evaluate the reversal rate of the renal structural alterations by daily insulin treatment. Eighteen rabbits, bred and fed in standard laboratory conditions, were divided into 3 groups each containing 6 animals. While control group animals received no treatment, the rest were injected with a single dose of intravenous 100 mg/kg alloxan. Four days after injection, blood glucose levels were determined and diabetes was confirmed for each animal. Half of the animals were spared for the experimental diabetes group whereas the remaining half received daily intramuscular 1.5 I.U/kg injections of insulin (insulin therapy group) for 2 months. At the end of the experimental period, all of the animals were killed and the kidneys were obtained. Following the mean kidney weight and volume measurements, tissues were processed for light and electron microscopy. Renal features were evaluated quantitatively using appropriate stereological methods, whereas qualitative observations were carried out under a Jenamed 2 light microscope and a Jeol 100C electron microscope. The quantitative data were compared statistically between the groups using Student's t-test. The mean kidney weight and volume were significantly higher in the experimental diabetes group than in the control and insulin therapy groups. The volume fractions of renal corpuscle occupied by glomerulus and the cortex occupied by proximal tubulus were significantly higher in the experimental diabetes group than in the control and the insulin therapy groups, which was consistent with the qualitative observations. The increased glomerular and proximal tubular volume fractions were consistent with the increased mean kidney volume. In conclusion, the qualitative findings of the present study were supported by quantitative evaluations such as the volume fractions and the mean kidney weight and volume. Therefore, it could be suggested that short-term experimental diabetes causes glomerular and tubular alterations, and those alterations might be reversed by daily insulin therapy.

Key Words: Experimental diabetes, insulin therapy, morphology, kidney, rabbit, stereology

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