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DIABETIC TENDINOPATHY: WHAT IS THE EFFECT OF TYPE 2 DIABETES ON TENDON? AN EVALUATION USING ATOMIC FORCE MICROSCOPY IMAGING AND GENE EXPRESSION ANALYSIS

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SUMMARY

The insulin resistance or insufficient insulin characteristic of type II diabetes(T2D) causes a person's blood sugar level to become hyperglycemic. No studies have as yet been undertaken on the effects of diabetic hyperglycemia on tendon ultrastructural and micromechanical properties. The objectives of this study are to determine the effect of T2D on the Achilles tendon (AT) ultra-structural properties and gene expression profiles. The ethical approval for this study was granted by the University Malaya Medical Centre Ethics committee (Reference number: 20157-1486). In this study, AT were collected from the patients who required a major lower limb amputation in UMMC and deceased donors of the Silent Mentor Programme, either with or without chronic T2D condition. Informed consent was obtained from each donor (or from their relatives for the SMP donors). The clinical samples collected were used for atomic force microscopy(AFM) analysis and gene expression analysis. Statistical analysis was performed to assess the statistical significance($p<0.05$). In the AFM analysis, the collagen fibril diameters were significantly larger in the T2D AT, while Young's modulus was significantly higher in the T2D AT. The mRNA gene expressions levels of VEGF, FMOD and TBP in AT were significantly differentially expressed in the T2D AT tendons. It is suggested that the increased in FMOD leads to an increase in the collagen fibrils diameters. VEGF is a potent pro-angiogenesis factor. Hypoxia might serve as a positive feedback stimulation that continuously stimulates VEGF production till the hypoxic condition is resolved. This study provides a novel understanding of the changes in tendon micro- and ultrastructural levels, as well as the molecular changes in the tendon, as an effect of chronic T2D. In conclusion, T2D alters AT tendon ultrastructural and micromechanical properties.

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