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Biomarker analysis in type-2 diabetic adhesive capsulitis model in rats

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Introduction & Aim: With various treatment modalities being researched, still little is known concerning pathogenesis or pathophysiology of adhesive capsulitis. Animal models simulating adhesive capsulitis are needed to further investigate these issues. The purpose of this study was to create a new experimental adhesive capsulitis on a rat model that simulates the metabolic characteristics of human type-2 diabetes mellitus (T2DM) and investigate the associated biomarkers.

Materials & Methods: Sprague-Dawley rats were separated into three groups. In one group, minimal invasive immobilization with extraarticular fixation of glenohumeral joints with Kirschner wires was achieved (IMM group). In the second group, same immobilization was achieved in type-2 diabetes mellitus (T2DM) rat model (IMM-T2DM group). T2DM model was achieved by feeding the rats with high-fat diet followed by a low dose of Streptozotocin (STZ) (35 mg/kg/day, i.p.). The control group underwent sham operation. The range of motion was measured under anesthesia. The abduction angle and total rotation angles were measured. At 2, 4 and 8 weeks, after the animals were killed, capsule specimens were obtained and gene expressions of cytokines related to inflammation and fibrosis (transforming growth factor-b1 (TGF-b1), tumor necrosis factor-a (TNF-a), Interleukin-1b (IL-1b), IL-6, matrix metalloproteinase (MMP)-9, MMP-2, fibronectin, connective tissue growth factor (CTGF), type-I & III collagen) were measured and intercellular adhesion molecule-1 (ICAM-1) was evaluated with real-time reverse transcription-polymerase chain reaction (RT-PCR).

Results: The abduction angle showed statistically significant decrease from the control group in both immobilization groups (IMM, IMM-T2DM). There was a similar difference for the total rotation angle. However, at 4 weeks, gene expression of cytokines related to inflammation and fibrosis (IL-1b, IL-6, TNF-a, TGF-b1, MMP-9, MMP-2) including ICAM-1 were significantly greater in IMM-T2DM group compared with control and IMM group.

Conclusion: A new experimental model for adhesive capsulitis was successfully established. Gene expression in the shoulder capsule may provide a particularly advantageous tool for therapeutic investigation.

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