Identification of extracellular matrix proteins in plasma as a potential biomarker in the diagnosis of intervertebral disc degeneration

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Abstract

Purpose: At the molecular level, disc degeneration (DD) has been associated with dissociation of matrix assembly, leading to the loss of structural integrity. As a result of matrix dissociation, tissue ECM proteins are expected to leak into the newly developed blood vessels that circulate in the peripheral blood, indicating diseased states. Experimental design: To identify the IVD tissue-ECM proteins leaked into diseased plasma, global proteomic analysis was performed on 10 healthy volunteers (HV) and 10 diseased subjects (DS) after depletion of highly abundant proteins such as Albumin and IgG. Results: 28 proteins were identified as matrix-associated proteins identical to the proteins found in intervertebral disc tissues. Of these, 26 were from DS and 21 from HV. Among these candidates, aggrecan and fibulin 1 were found to be up and downregulated significantly in the DS group. Interestingly, diseased plasma had a specific expression of COL2A1, native to the nucleus pulposus. Conclusions and clinical relevance: The upregulated and unique presence of aggrecan and collagen type 2A1 respectively in diseased plasma remains indicative of intervertebral disc disease progression. This identification could aid in understanding the altered protein signature that remains indicative of tissue damage and the circulation of damaged tissue products.

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