Perlecan Expression in Placental Development and Gestational Diabetes Mellitus

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Abstract

The proteoglycan perlecan is involved in cell signaling, regulation of growth factor activity, and maintenance of basement membranes. This study aims to investigate the expression of perlecan during placental development and whether hyperglycemia of gestational diabetes mellitus induces the alteration of perlecan expression in placenta. Immunohistochemistry, immunoprecipitation/sodium dodecyl sulfate-polyacrylamide gel electrophoresis, and quantitative real-time PCR were carried out to study the placental perlecan expression at different trimesters of pregnancies and in gestational diabetes mellitus. The perlecan protein was mainly immunolocalized in the trophoblast and vessel basement membranes with some staining in the villous stroma of placental villus. Perlecan was also found to co-localize with laminin and collagen IV in the basement membranes of placenta. The protein and mRNA levels of placental perlecan were significantly decreased as the gestational age increased. However, a significant increase in perlecan expression was observed in the third trimester placentas with gestational diabetes mellitus compared to the gestational age-matched controls. Furthermore, trophoblast cells cultured in a high glucose (30 mM) medium and a high osmotic pressure medium (5.6 mM glucose and 24.4 mM mannitol) showed increased perlecan expression compared to cells cultured in the low glucose (5.6 mM) regular medium. These alterations of perlecan expression may be associated with the structural changes of placenta during maturation. The metabolic effect of high glucose and high osmotic pressure of gestational diabetes mellitus may contribute to the increased perlecan expression of diabetic placentas.