Does umbilical coiling index affect mechanisms of placental-fetal blood flow?

Capelle X, Schaaps JP, Bavi diddo JV, Dauby M, Kridelka F
CHU of Liège, Department of Obstetrics and Gynaecology, 4000 Liège, Belgium, Liège, Belgium

Objective
The aim of the present study was to investigate changes of maximum velocity along the umbilical vein and the correlation with the umbilical coiling index.

Methods
Forty-five patients between 20 and 28 weeks of gestation were included in the study. The maximum velocity in the umbilical vein, measured at both fetal and placental ends, was assessed for several sonographic parameters of the cord including antenatal umbilical coiling index (UCI), diameter of the umbilical vein at both ends (mm), cord cross-sectional area (cm²) and Wharton’s jelly area (cm²).

Results
The UCI was 0.38 +/-0.15 with a percentile 10 and 90 respectively of 0.26 and 0.48. There was a difference in maximum velocity between the two extremities of the umbilical vein (Δ UV max V). Maximum velocity was higher at the fetal umbilical level (14.12 +/-3.18 cm/s) than at the placental end (11.93 +/-2.55 cm/s; p < 0.0001). The mean difference is 2.2 +/-2.3 cm/s. No difference was noted in terms of umbilical vein diameter measured at both cord ends (umbilical 4.85 +/-0.9 mm, placental 4.86 +/-0.87 mm). In univariate and multivariate analysis there was a significant inverse relationship between the UCI and the Δ UV max V (P = 0.0069, r = 0.40). There was no significant relationship between the Δ UV max V and cord cross-sectional area or Wharton’s jelly index.

Conclusion
The changes in maximum velocity that were measured in the umbilical vein along the cord could be explained by modifications of the spatial velocity profile and pulsometer model. There was a significant inverse relationship between the UCI and the difference in maximum velocity between the two extremities of the umbilical vein. Umbilical coiling index could then affect mechanisms of placental-fetal blood flow. Further investigation using mathematical and numerical models are necessary.