

## Vessels of the umbilical cord: an anatomico-microscopic study in normal and pathological newborns

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Intrauterine growth restriction (IUGR) due to placental insufficiency is associated with blood-flow redistribution. Placental insufficiency in late-onset IUGR often goes undetected by umbilical artery Doppler scan. Despite a broad general body of literature referencing placentas of IUGR pregnancies, there are no reports on the structural characteristics of the vessels of the umbilical cord in IUGR. Thus, the aim of the present study was to compare the microscopic anatomy of the umbilical arteries and veins in normal, IUGR and small for gestational age (SGA) newborns. Twenty six umbilical cords were taken from 10 IUGR, 5 SGA, and 11 controls newborns. The histological and morphological examination was performed with EE, Azan–Mallory, Sirius Red stains and morphometric evaluation was performed through a computer image analysis approach. In the controls, the umbilical artery shows a muscular tunica, organized by two layers, an outer one with circularly arranged cells, and an inner one, with irregularly arranged cells. In the IUGR longitudinal muscular fibers are observable. In IUGR the percentage of the muscular fibers of the umbilical artery was greater with respect to SGA and controls. In IUGR and SGA the percentage of the muscular fibers was minor with respect to controls. In the umbilical artery in IUGR and SGA the elastic fibers and collagen I was major and collagen III was minor with respect to SGA. In the umbilical vein the collagen III was major in IUGR and SGA with respect to controls. These data agree with those of intrauterine life, in which a major thickness of the abdominal aortic wall was observed in fetuses with abnormalities of Doppler flowmetry. The rearrangement of umbilical artery may affect the mechanical properties of these vessels and disturb fetal blood circulation.

### Keywords

Umbilical artery; umbilical vein; morphometry; IUGR.