

Article Review

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Excerpts from **TO KNOW ME TO IS LOVE ME: THE PLACENTA** Fetal Indications: Intrauterine Growth Retardation (IUGR)

Placentas are often submitted to Surgical Pathology for examination because of fetal growth retardation/"runting"/SGA (small for gestational age), defined as birth weight less than the tenth percentile for gestational age. For various reasons, the intrauterine growth of affected fetuses has been delayed, due to chronic utero-placental insufficiency or a fetal anomaly, or it may merely be a variation of normal. During gestation, these fetuses are at an increased risk for vital organ damage and death. After birth, these infants experience different problems from premature infants, namely: asphyxia, hypoglycemia, polycythemia, hypothermia and increased perinatal mortality. Some studies suggest some of these infants may experience long term complications such as lower IQ, learning and behavioral disorders, or major neurological handicaps such as seizure disorders, cerebral palsy and severe mental retardation.

During the first 35-36 weeks of gestation, fetal growth is predominantly due to *hyperplasia*, followed in late gestation by *hypertrophy*. Failure of hyperplasia (i.e., hypoplasia) cannot be reversed, by definition develops in early gestation and is typically due to genetic (chromosomal abnormalities, congenital anomalies), teratogenic, infectious or other systemic factors (severe maternal malnutrition). Beginning as early as the first trimester, growth of the fetus is persistently impaired resulting in a reduction in the absolute size of the body, organs and brain, i.e. **symmetrical IUGR**.

Failure of hypertrophy (i.e., hypotrophy) is often reversible, by definition occurs in late gestation and is more often due to fetal malnutrition due to compromised utero-placental circulation. Early fetal growth is normal; in late gestation the decreased supply of oxygen and nutrients leads to hypoxia with decreased soft tissue and muscle mass development, and decreased hepatic glycogen deposition. Because the fetal blood supply preferentially supplies the brain, it develops more or less normally compared to the body and organs which variably suffer the ill effects of hypoxia, resulting in **asymmetrical IUGR**. However, if pathogenesis begins early in the second trimester, the head may not be spared. Asymmetrical IUGR is highly associated with fetal distress, prenatal meconium discharge, intrauterine asphyxia and postpartum hypoglycemia.

Both the hyperplastic and hypertrophic growth retarded infants appear wasted at

delivery even if their birth weights are over 2500 grams.

The etiology of fetal growth retardation is typically variable, rarely attributable to a single cause. Impaired placental circulation is the most common cause and may be due to abnormal placental anatomy, but is more frequently due to abnormal placental function due to maternal cigarette smoking, maternal hypertension, infection, infarcts and chronic villitis. Congenital infection of the fetus, chromosomal abnormalities and congenital malformations, and other maternal factors such as poor diet, living at a high altitude, hemoglobinopathy and alcohol use may also contribute to fetal growth retardation. Fetal growth retardation is more common with a prior history of IUGR. First degree female relatives with a history of abortion or fetal demise also have a 2-fold increased risk for IUGR particularly if their pregnancy is complicated by poor maternal weight gain, reduced uteroplacental blood flow and maternal cigarette smoking.

Infants suffering from symmetric IUGR tend to remain physically small while asymmetrical IUGR infants experience "catch-up" growth during their first six months, particularly if the growth retardation was significant. As a group, growth retarded infants have more neurological and intellectual deficits and major neurologic handicaps as compared to their non-growth retarded peers, particularly when the birth weight is more than 25% below the mean for gestational age.

Improvements in prenatal and neonatal care have decreased the mortality rate for growth retarded infants to only 1.5-2 times that of non-growth retarded infants. Infants of mothers who smoke weigh about 200 grams less than infants not exposed to maternal cigarette smoking during gestation. The amount of neonate weight reduction is related to the number of cigarettes smoked per day. These infants are also shorter and are at greater risk for intrauterine death and compromise during labor. *In the United States today, cigarette smoking is the most common preventable cause of fetal growth retardation.*

Symmetrical IUGR

- usually recognized before 32 weeks
- seen in 1/3 of IUGR cases
- head:body size ratio remains normal
- causes include:
 - trisomy 13, 18 and 21
 - Turner's syndrome
 - ploidy
 - neural tube defects
 - chondrodystrophies

- infections such as Cytomegalovirus, rubella, Toxoplasma, malaria, Listeria
- drug exposure such as tobacco, cocaine, warfarin, methotrexate

Asymmetrical IUGR

- usually seen after 32 weeks
- seen in 2/3 of IUGR cases
- size ratio of head:body is increased
- causes include:
 - maternal: hypertension, anemia, renal disease, malnutrition, cyanotic lung disease, systemic lupus erythematosus
 - placental: infarcts (strongly associated with IUGR), placenta previa, partial abruption, circumvallate membrane insertion, marginal or velamentous cord insertion, single umbilical artery (two vessel cord), fetal stern vessel lesions, chorioangioma, chorioamnionitis, maternal floor infarction
 - placental, microscopic: chronic villitis, chronic ischemic changes, increased perivillous fibrin, increased fetal nucleated red blood cells.
 - the placenta may show one or many of the gross and microscopic changes.

References:

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