Article Review

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Excerpts from

TO KNOW ME TO IS LOVE ME: THE PLACENTA

Maternal Indications: Hypertensive States of Pregnancy

Placentas are frequently submitted to Surgical Pathology for examination because of a maternal history of pregnancy induced hypertension, pre-eclampsia, eclampsia, chronic hypertension/pregnancy- aggravated hypertension or HELLP syndrome. Despite decades of intensive research, the etiology of why and how pregnancy causes or intensifies hypertension remains unknown.

Hypertensive disorders, those in which blood pressure exceeds 140/90 mm Hg are known to develop as a consequence of pregnancy and to regress postpartum. They are common, highly hereditary, account for a large number of maternal deaths and remain the most important unsolved problem in obstetrics. Improved prenatal care, including early detection and appropriate treatment, may extend gestation enough to ensure a satisfactory outcome for fetus and mother.

Pregnancy induced hypertension (PIH) is hypertension which develops during pregnancy, not associated with proteinuria or pathological edema.

Pre-eclampsia is a triad of 1) PIH, 2) generalized pathological edema (edema which is not only dependent, but also involves the face and hands, and persists after rising), and 3) proteinuria (300 mg or more in 24 hours). It is classified as mild or severe, based upon the severity of: 1) blood pressure elevation; 2) proteinuria; 3) oliguria; 4) cerebral or visual disturbances; 5) epigastric pain; and 6) pulmonary edema or cyanosis. However, there may be rapid progression from mild to severe disease. Seen in 5% of pregnancies, pre-eclampsia occurs most commonly in the first pregnancy after 20 weeks of gestation, most often near term - after 34 weeks gestation. Other predisposing factors include: Black race, maternal age less than 20 years and older than 35 years, low socioeconomic status, multifetal gestation, molar pregnancy, polyhydramnios, nonimmune fetal hydrops, underlying renal disease and diabetes. It may be associated with premature delivery. Fetal risks include: acute and chronic uteroplacental insufficiency possibly resulting in intrapartum fetal distress, fetal growth retardation and stillbirth, and the complications of prematurity.

Some people use the terms PIH and pre-eclampsia interchangeably.

Eclampsia is defined as pre-eclampsia with the occurrence of grand-mal seizures before, during or after labor not attributable to other causes. The seizures are attributed to platelet thrombi, localized vasoconstriction with resultant hypoxia, and hemorrhagic foci in the cerebral cortex. The severity of hypertension correlates poorly with the seizures.

Seen in 0.2-0.5% of pregnancies, eclampsia rarely develops before 20 weeks gestation; 75% of seizures occur before delivery; 50% of postpartum seizures occur within 48 hours of delivery, the remaining occur as late as 6 weeks postpartum.

Chronic hypertension persists before conception or 20 weeks gestation, or persists for more than 6 weeks postpartum. In 80% of cases, it is idiopathic; it is related to renal disease in the remaining 20%. Fetuses are at risk for prematurity (25-30%), fetal growth retardation (10-15%), intrapartum fetal distress due to chronic uteroplacental insufficiency or placental abruption, and death.

HELLP Syndrome: (Hemolytic anemia, Elevated Liver enzymes and Low Platelet count) is present in 10% of cases of severe pre-eclampsia/eclampsia, particularly in Caucasian women with delayed diagnosis or delivery and in those with placental abruption. It may also develop in women with normal blood pressure. HELLP syndrome may be misdiagnosed as hepatitis, gallbladder disease, idiopathic thrombocytopenic purpura or thrombotic thrombocytopenic purpura. Most of the hematologic abnormalities normalize within 2-3 days postpartum; thrombocytopenia may persist for up to 7 days. HELLP syndrome may be associated with preterm labor, therefore the fetus is at risk for the complications of prematurity; other fetal risks include: acute and chronic uteroplacental insufficiency which may cause intrapartum fetal distress, fetal growth retardation or death.

Although the etiology of PIH remains unknown, it has been postulated to result from decreased prostacyclin production or an imbalance of prostaglandin secretion, related to vasoconstriction. No correlation between placental lesions and parity, degree or proteinuria, severity and duration of hypertension or its therapy, has been found. Some studies suggest inappropriate immune reactions as a possible cause.

During normal, early placental development, the trophoblastic placental shell infiltrates the arteries of the decidua and myometrium. It destroys the vessel walls, "remodeling" them in such a way as to interfere with the blood vessel's normal ability to contract in response to vasoconstrictors, i.e. they remain constantly dilated/open, allowing for unimpeded blood flow from the uterus to the placenta. With pre-eclampsia, this process is hindered: the blood vessels are incompletely remodeled, perhaps due to trophoblastic failure or mediated by maternal influences, and the blood vessels remain responsive to vasoconstrictors, i.e. they remain constricted/closed, resulting in impeded blood flow from the uterus to the placenta. These narrow, undilated blood vessels persist through out pregnancy; they cause uteroplacental insufficiency with resultant retarded placental growth; they are prone to thrombosis with subsequent placental infarction and arterial rupture with subsequent placental abruption.

Fetal growth retardation is related to the decreased uteroplacental blood flow and decreased villous volume for fetoplacental exchange. The fetus is at risk for the complications of prematurity due to preterm delivery secondary to abruption.

Grossly, the placenta may be small (decreased uteroplacental blood flow may result in retarded placental growth); there may be changes associated with abruption (due to rupture of decidual vessels); commonly there are infarcts (due to

thrombosed decidual vessels), often centrally or diffusely distributed. With preterm delivery, the umbilical cord may be edematous; there may be a single umbilical artery (2-vessel umbilical cord); there may be a circumvallate placenta; there may be an increased number of intervillous thrombi.

Abruptio placentae is a clinical condition in which the placenta separates prematurely from the uterine wall - before delivery of the fetus. Because the majority of the placenta is still attached to the uterine wall, the maternal arteries in the region of the separated placenta continue to bleed, resulting in accumulation of blood between the placenta and uterine wall. And, because the separated region of the placenta is devoid of maternal blood flow, there is collapse of its intervillous space, i.e., infarction.

In cases of very acute abruption (25-50% of cases), there may be no grossly appreciable placental abnormality. Adherent, sometimes laminated blood clot, occasionally dissecting into adjacent placental parenchyma, may be seen with a recent abruption. The clot of an older abruption is firm, dry and stringy, and eventually brown. The placental tissue overlying and adjacent to the adherent blood clot may be: a) dark red due to villous hemorrhage - an early hemorrhage; b) thinned out, over a "saucer-like" depression; or c) depressed, firm and pale with a several day old infarct.

Fetal circulation does not maintain the integrity of the placental villous tissue; rather, this integrity depends upon the *maternal* intervillous blood flow to supply oxygen and nutrients. A placental **infarct** results from localized interruption of the maternal blood supply, resulting in a regional collapse of the intervillous space with crowding, touching of neighboring villi. Grossly, the infarcts are firm due to the crowded villi; they may be dark red-brown or yellow-white depending upon their age and intervillous space blood content. Acute infarcts are grossly firm and microscopically show villous congestion. Older infarcts are grossly yellow-white and microscopically show progressive loss of nuclear staining, initially of the trophoblast and finally of the entire villus, with fibrin deposition in the intervillous space. *Keep in mind, true organization of the infarct never occurs !* It is important to estimate and record the total amount of infarcted placental parenchyma. In term placentas, small infarcts are common and possibly "normal." However, any infarct in a premature placenta is abnormal. Large infarcts (larger than 3 cm), even at term, particularly when centrally located, are also abnormal; they are associated with serious perinatal morbidity and mortality. If the uteroplacental circulation is basically sound (with large functional reserve capacity) and the villi are normal, infarcts involving 30-50% of the placental volume may not impact fetal well being. Typically, however, infarcts of 10% or more of placental volume are rarely seen without generalized ischemic villous change. Depending upon the maternal vascular condition (hypertension, pre-eclampsia), placental infarcts involving as little as 10% of the parenchyma may be associated with fetal growth retardation, fetal hypoxia/ distress and even fetal death.

Intervillous thrombi (IVT) are smooth, glassy dark red masses, sometimes with lines of Zahn, often located in the maternal injection jet "holes" of the intermediate zone of the placental parenchyma. When fresh, IVT are dark and red; when old, they are yellow to white due to laminated fibrin, in contrast to an infarct (collapsed intervillous space with crowded villi), an IVT displaces villous tissue.

IVT are present in about 30% of uncomplicated term pregnancies. They are believed secondary to small (less than 5 cc), focal fetal-to-maternal hemorrhage due to increased hydrostatic pressure in the fetal capillaries. Small fetal-to-maternal hemorrhages are not uncommon with labor, and usually are not significant. Massive (greater than 50-80 cc) fetal-to-maternal hemorrhages are unusual and frequently are associated with poor perinatal outcome.

Microscopically, the principal pathologic changes of PIH are: 1) decidual arteriopathy (acute atherosis, hyperplastic arteriosclerosis); 2) infarcts; 3) abruptio placentae; and 4) Tenney-Parker changes (increased syncytial knots). Some or all of the changes may be present; there are no pathognomonic lesions.

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NEWSLETTER QUIZ

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