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Cytomegalomvirus, Toxoplasmosis, and Parvovirus B19 and Pregnancy

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Maternal infection during pregnancy represents an elusive area in teratology. It is known that many infections can be transmitted from mother to fetus, however, not all fetuses are infected and not all infected fetuses show symptoms. The spectrum of effects on the fetus hinges on many factors. These variations depend on the stage of gestation the illness was contracted and whether it is a primary or recurrent infection. Cytomegalovirus, toxoplasmosis, and parvovirus will be discussed in this issue of RISK||NEWSLETTER.

It is important to emphasize the difference between a primary and recurrent infection. A primary infection is one in which the individual has the infection for the first time. A recurrent infection is one in which there is reactivation of a prior infection or reinfection with a new strain. A woman who is IgM positive and IgG negative probably has a primary infection. If a woman is IgG positive and expressing symptoms, then it is probably a recurrent infection. Women who have had a previous infection may have a reactivation of the infection during pregnancy.

CYTOMEGALOVIRUS (CMV)

Background

CMV is a DNA virus and a member of the herpes virus group. Congenital CMV is the most common intrauterine infection, affecting 0.4-2.3% of live born infants. In the United States, about 1% of infants are infected prenatally; this equates to 40,000 new cases annually (Fowler et al., 1992).

CMV is acquired by direct contact from body fluids of young children (ie., saliva, urine), or by sexual contact. CMV infection can either be primary or recurrent. Prospective studies have shown seropositive rates of 35-55% among pregnant women from middle and higher income groups and 77-82% among pregnant women from lower income groups (Paul, 1993).

Pregnancy

The majority of CMV infections during pregnancy are asymptomatic but can present with a mononucleosis-like illness. Symptoms may include fever, lymphadenopathy, splenomegaly and elevation of peripheral lymphocyte count (Paul, 1993). The rate of transmission of infection to the fetus differs depending upon whether the woman has a primary or recurrent infection. Transmission to the fetus is about 40-50% if a primary infection. This rate drops to 5% if a recurrent infection (Fowler et al., 1992).

Congenital CMV often results in hepatosplenomegaly, chorioretinitis, microcephaly, periventricular calcifications, hydrocephaly, sensory neural hearing loss, mental retardation, and intrauterine growth

retardation. Ninety percent of affected newborns are asymptomatic at birth, however, 5-17% of these babies may develop symptoms within two years. Children that develop symptoms later are at risk for sensorineural hearing loss, chorioretinitis, and neurologic deficits (Grose et al., 1989). Of the 10% of infants affected at birth, 90% have central nervous system (CNS) damage.

Primary infections result in an array of sequelae including hepatosplenomegaly, chorioretinitis, microcephaly, hydrocephalus, deafness, and mental retardation. Recurrent infections may be associated with hearing loss (usually not bilateral), chorioretinitis, and perhaps other neurologic sequela but do not appear to increase the risk for mental retardation. Risks of sequelae in children with congenital CMV infection according to the type of maternal infection are presented in the following box.

SEQUELAE OF INFECTION

PRIMARY RECURRENT

Sensorineural Hearing Loss 15% 5%
Bilateral hearing loss 8% 0%
IQ<70 13% 0%
Chorioretinitis 6% 2%
Other Symptoms 6% 2%
Any sequelae 25% 8%

Timing

There exist differing opinions as to if there is a relationship between the trimester in which the mother was infected and infant outcome. Some researchers have found an association between infection in the first half of pregnancy and more severe abnormalities, while others have not found no such association.

Prenatal Diagnosis

Prenatal diagnosis for MV is possible using amniocentesis, PUBS, and ultrasound. The presence of IgM or the virus in culture can be determined in amniotic fluid or fetal blood; ultrasound can detect some of the structural anomalies associated with congenital CMV, such as IUGR, CNS abnormalities, and hydrops. The accuracy of these tests is unknown at this time (Grose et al., 1990). The detection of CMV is also possible using DNA techniques (e.g., polymerase chain reaction or PCR) and chorionic villi (Dong et al., 1994).

TOXOPLASMOSIS

Background

Toxoplasmosis is caused by the intracellular protozoan, Toxoplasma gondii. It can be contracted by eating undercooked infected meat, or handling soil or cat feces that contain the organism. Localized lymphadenopathy is a common symptom. Most adults are asymptomatic. The incidence in the newborn population is 0.25-8 per 100.

Pregnancy

The toxoplasmosis parasite is known to cross the placenta. The effect on an infected fetus and/or neonate is variable. Some of the features associated with congenital toxoplasmosis are: encephalitis, hydrocephalus, intracranial calcification, chorioretinitis, erythroblastosis, anemia, jaundice, hepatosplenomegaly, glomerulitis, myocarditis, and myositis. Long term effects may include seizures, mental retardation, cerebral palsy, deafness, and blindness.

Timing

Congenital toxoplasmosis only occurs when the mother has a primary infection. The likelihood of

infection varies with the time of gestation that the infection occurred. There is a higher risk for transmission if the infection occurs late in pregnancy; the risk varies from 1% if the infection is preconceptual to 90% if the infection is near term. There is a higher risk for clinical features if severe maternal infection occurs early in pregnancy. The highest risk for having a baby with severe manifestations occurs when there is maternal infection between 10-24 weeks gestation (Desmonts, 1982).

A prospective study of 542 women who acquired toxoplasmosis during pregnancy showed that of those who had first trimester infection, 6% had severe congenital toxoplasmosis and 5% of these infants died. Infections during the second trimester resulted in 2% of the infants with severe congenital toxoplasmosis, with 2% of these infants failing to survive. There were no effects observed if acquisition occurred during the third trimester (Desmonts, 1990). Another study of 210 prospectively identified infants with congenital toxoplasmosis found 40% of maternal infections occurred in the first trimester, 18% in the second trimester, and only 3% in the third trimester.

Prenatal Diagnosis

There are several methods available for the prenatal diagnosis of toxoplasmosis. Testing for the parasite and an IgM assay can be performed via PUBS, CVS, or amniocentesis. A level II ultrasound can detect some of the morphological abnormalities associated with toxoplasmosis, such as hydrocephalus and hydrops. Ultrasound, however, is not considered a reliable method of determining if the fetus is indeed infected. Prenatal detection of toxoplasmosis DNA has been successful utilizing PCR performed on amniotic fluid (Cazenave et al., 1992; Johnson et al., 1993).

PARVOVIRUS B19

Background

Parvovirus B19 (Fifth disease) is a DNA virus that causes erythema infectiosum, characterized by a rose-colored macular rash and fever. Adults may not express symptoms even when serologic studies indicate a recent infection. Parvovirus is mildly contagious, with transmission occurring through respiratory secretions. The most intense stage of contagion is during viremia and prior to any clinical signs. Risk for transmission of parvovirus to the fetus is associated with an active primary infection (ie., IgM positive). About 50% of adults are immune, and the rate of infection among nonimmune household members is 12-50% (Risklines, 1991). The rate of infection in susceptible teachers is 20%, with the risk being somewhat increased for those teachers working with younger children.

Pregnancy

The transplacental infection rate of parvovirus is approximately 33%. IgM appears within 72 hours after the onset of symptoms and begins to decline after 30-60 days, but can persist for up to six months. A pregnant woman found to be serologically negative either may be nonimmune and therefore susceptible to parvovirus or may actually be infected but tested prior to the mounting of an immune response. Thus, if the initial testing occurred within 7 days of exposure, the patient should be retested 4 to 6 weeks after the initial exposure to determine if the IgM did not become positive. If the pregnant woman is found to be immune, then there is virtually no risk for infection to the mother or fetus.

Fetal infection wit parvovirus can cause severe anemia, hydrops, spontaneous abortion, and intrauterine fetal demise. Hydrops may be associated with cardiomyopathy. Many fetuses that develop hydrops die, but the hydrops can resolve. In a prospective study, maternal infection before 20 weeks was associated with a 17% loss rate; if infection occurred after 20 weeks, the loss rate dropped to 6% (Public Health Laboratory Service Working Party on Fifth Disease, 1990)The effect on fetal development is usually present within 4-6 weeks after maternal symptoms (Risklines, 1991). It has been suggested that intrauterine blood transfusions may alleviate the fetal anemia (Rodis et al., 1988). Congenital

parvovirus is not associated with an increased risk for birth defects. The overall risk of adverse pregnancy outcome after infection is 2-10%.

Prenatal Diagnosis

Prenatal diagnosis of infected fetuses is possible by ultrasound and MSAFP screening. Serial ultrasound has been recommended to look for hydrops, edema, ascites, and effusions (Risklines, 1991). It has been indicated that high levels of AFP in the maternal serum may be a marker for fetal infection. Measurement of IgM in the amniotic fluid or fetal blood is not a reliable indicator of fetal infections if negative. Detection of viral DNA through PCR is possible, however (Carrington et al., 1987).

For more on the web:about Fifth Disease
and about Toxoplasmosis