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Diagnosis and Management of Human Parvovirus B19 Infection

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Thirty years have passed since the initial identification of human parvovirus B19 in 1975 by Cossart and colleagues [1]. B19 is a small, nonenveloped, single-stranded DNA virus that causes erythema infectiosum (fifth disease) in children [2,3]. Lacking a lipid envelope makes B19 resistant to antiviral procedures such as detergent and heat treatments [4]. Infection with B19 is limited to humans. Transmission is mainly by respiratory secretions and in some instances by blood products [4]. Winter and spring months are the endemic period for B19. Seroconversion of B19 depends on seasonality and the locale.

The annual incidence of acute B19 infection in pregnancy has been estimated to be 1 in 400 pregnancies [5]. The risk of acute infection is highest in susceptible pregnant women with children ages 6 to 7 years, followed by number of children in household, and school teachers [6]. Because the risk of acquiring B19 infection is highest in women who have school-aged children at home, strategies of decreasing occupational exposure in susceptible pregnant women are ineffective; however, case reports of fetal hydrops and death have occurred after maternal infection with B19 [7]. The obstetrician is often faced with a phone call from a frantic pregnant woman who has been exposed to B19. In this article, the authors review the natural history of B19, pathophysiology, diagnosis, management schemes, and both noninvasive and invasive methods to monitor for fetal anemia.

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Natural history and pathogenesis

B19 can be found worldwide. Once exposed, host viremia peaks during the first 2 days and can last for up to 7 to 12 days. During the first phase of infection, viral replication occurs in human erythroid-progenitor linage cells and induces cell cycle arrests at both G1 and G2 phases [4]. Viral entry into target cells is mediated by a range of cellular receptors, including P antigen and β integrins [8]. P antigen distribution is most commonly found on cells of the erythroid lineage, but is also found on platelets and tissues from the heart, liver, and lungs [9]. Pathogenesis of B19 infection includes lysis of red blood precursors [10], which may lead to severe anemia. During the phase of viral replication and shedding, the patient is generally asymptomatic. When the characteristic rash develops or arthralgias are present, the patient is in the second phase of the disease process. During this phase, the patient is not infectious to others. The pregnant woman may present with a variety of symptoms, such as a flulike syndrome with low-grade fever, sore throat, generalized malaise, and headache. In the study by Hager and colleagues [11], of 618 pregnant women who were exposed to B19, 52 (8.4%) contracted the infection. Of these, 46% presented with arthralgias of the knees, fingers, and wrists. Immunocompromised patients, including those who have AIDS, hemoglobinopathies, cancer, and transplant recipients, may develop a chronic B19 infection resulting in anemia and aplastic crisis [12].

Parvovirus B19 inhibits erythroid cell differentiation by cytotoxic apoptosis. With marked fetal anemia, fetal hydrops may be identified with abnormal fluid collections such as subcutaneous or scalp edema, pericardial or pleural effusions, fetal abdominal ascites, or hydramnios. Additionally, marked hepatosplenomegaly, cardiomegaly, and thickened placenta may be demonstrated [5]. The mechanisms of hydrops include infection of progenitor cells, inducing fetal anemia and tissue hypoxia. This in turn increases cardiac output, and the fetus develops high-output cardiac failure. Approximately 3% of fetuses infected with B19 will develop hydrops [5].

Diagnosis

Physicians must have a high index of suspicion to diagnose a B19 infection during pregnancy. Most frequently, an evaluation is performed after the pregnant woman has been exposed to a child diagnosed with erythema infectiosum (fifth disease). Similarly, a high index of suspicion for B19 should always be considered in the evaluation of a fetus that has nonimmune hydrops. In contrast to children, only about one third of women present with a rashlike illness [11]. In approximately 25% of cases, the patient is asymptomatic. Diagnosis of infection is made by serologic testing, and several immunoassays have been developed over the years. The nature of the antigen incorporated into the serology affects its performance [13]. Currently there is only one US Food and Drug Administration-approved mμ-capture enzyme immunoassay (EIA) that detects specific IgM