Transplacental Disorders

Perinatal Detection, Treatment, and Management

TRANSPLACENTAL DISORDERS

PERINATAL DETECTION, TREATMENT, AND MANAGEMENT (INCLUDING PEDIATRIC AIDS)

Proceedings of the 1988 Albany Birth Defects Symposium XIX,
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Preface

This volume, *Transplacental Disorders: Perinatal Detection, Treatment, and Management (Including Pediatric AIDS)*, records the proceedings of the nineteenth annual Birth Defects Symposium. The theme of transplacental disorders was chosen because in recent years there has been an increased awareness of maternal conditions, disorders, and diseases that transfer to the fetus via the placenta. These have, in turn, presented society with the subsequent legal dilemma of protecting the fetus from the sequelae of adult lifestyle without interfering with the legal rights of the mother. HIV infection in children is an obvious example of the problem: Seroprevalence studies have shown that two percent of newborns in some New York City hospitals test positive for HIV antibodies. The magnitude of the pediatric AIDS problem has tended to overshadow prenatal exposure to other disorders and diseases. However, high numbers of babies are being exposed prenatally to cocaine or other illegal drugs during pregnancy. Sexually transmitted diseases have increased tenfold since 1960. The Centers for Disease Control has advised that all pregnant women be tested for hepatitis B virus because of the prevalence of maternal hepatitis B infection and the availability of neonatal vaccination.

Presentations at the symposium reported on current perinatal research and clinical investigations of the biomedical basis of placenta-mediated disorders and their prevention. The epidemiology and diagnosis of these disorders and the care of the affected mothers and children were described. Examples surveyed included the transfer of maternal antibodies, infectious diseases (HIV, hepatitis, streptococcus), addictive drugs, and other teratogens that adversely affect the fetus and neonate. Important ethical issues dealing with the legal status of the fetus and the rights of pregnant women were discussed. Because of the impact of perinatal disorders on families, health care delivery systems, and communities, the symposium provided a forum to discuss current biomedical and sociolegal issues of these disorders and served as an informational exchange between the scientist, physician, clinician, laboratory

worker, and other professionals and lay persons interested in perinatal health care.

Our hope is that this record of the symposium proceedings will serve as a useful guide for health professionals who provide care to pregnant women and their children.

Ronald Bellisario
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ACUTE CHORIOAMNIONITIS, ITS ORIGINS AND ITS CLINICAL CONSEQUENCES

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INTRODUCTION

Acute chorioamnionitis occurs when bacteria gain access to the fetal membranes, decidua and amniotic fluid. It is the most frequent cause of preterm labor wherever it has been studied around the world (1, 2) and appears to be responsible for about a third of the preterm births in the United States (1, 2). Since the frequency of preterm birth has hardly changed in the United States during the past three decades, it is unlikely that anything being done in the health care system is preventing many cases of acute chorioamnionitis (3). This paper reviews what the past has disclosed about acute chorioamnionitis and also recent findings about its genesis and consequences.

Identifying the Disorder and Its Causes

Acute chorioamnionitis is characterized by an acute, diffuse inflammatory process in the extraplacental membranes, chorionic plate of the placenta, and umbilical cord (1, 2). This inflammatory process can be absent in individual sections taken from the umbilical cord and fetal membranes, but it is reliably found in very thin areas of the chorionic plate of the placenta where there is little or no blood clot attached to the underside of the plate.

Many investigators have doubted that microorganisms are responsible for all cases of acute chorioamnionitis because numerous studies have failed to culture bacteria from about

half of the affected placentas. In recent years improved culture techniques have led to the isolation of bacteria and mycoplasmas from 70-80% of placentas and extraplacental membranes when histologic findings of acute chorioamnionitis were present (4, 5). About two-thirds of the cultures are pure cultures of single organisms. Nearly half of these organisms are anaerobes (4), some of which may take many days or weeks to isolate because they have fastidious growth characteristics. When proper culture techniques are used, bacteria or mycoplasmas are recovered from only about 15% of placentas and membranes which have no histologic findings of chorioamnionitis. In studies where microorganisms have been isolated as often from placentas without chorioamnionitis as with chorioamnionitis, the spectrum of organisms identified indicates that the cultures were heavily contaminated by vaginal flora (6, 7). Culture techniques are available to avoid such contamination (7). One should assume that vaginal contamination has taken place when Propioni bacterium acnes, coagulase negative staphylococci and lactobacillus sp. are recovered from placenta and membranes.

In contrast to the high recovery rate of bacteria and mycoplasmas from tissues in cases of chorioamnionitis, bacteria are recovered from the amniotic fluid in only about 10% of such cases. One can speculate that the normal antibacterial systems in amniotic fluid might be responsible for the low rate of bacterial recovery from the amniotic fluid but no certain explanations are currently available.

There is evidence that nonbacterial substances found in the amniotic fluid do not cause chorioamnionitis. Lauweryns et al (8) have shown that all of the microscopic features of acute chorioamnionitis can be produced in animals by introducing various species of bacteria into the amniotic fluid, but not by introducing various nonbacterial substances that can be present in amniotic fluid, e.g., meconium, gastric juice, and amniotic fluid debris. We have found no relationship between chorioamnionitis and increasing maternal gestational antibody titers to the 10 viruses that most often infect the fetus, so it appears that viral infections are not a cause of acute chorioamnionitis (1).

The bacteria and mycoplasmas recovered from placentas and membranes in cases of chorioamnionitis are a subset of the bacteria and mycoplasmas that are normally present in

the vaginal flora. In only about 10% of cases of histologic chorioamnionitis do gravid women develop clinical evidence of infection. In such instances the bacteria recovered from the placenta and membranes usually are highly virulent (9). In cases of chorioamnionitis without such clinical findings, recovered bacteria and mycoplasms usually have low virulence. There is a positive association between vaginal and cervical colonization with Chlamydia trachomatis and premature membrane rupture, preterm delivery and low birth weight (10, 11). In contrast, C. trachomatis is rarely recovered from the placenta and fetal membranes when chorioamnionitis is present and thus is presumed to be rarely directly responsible for chorioamnionitis. The same is true for group B streptococci and Neisseria gonorrhea. Both are often present in the vagina and cause neonatal morbidity, but they are rarely cultured from the placenta and fetal membranes in cases of chorioamnionitis in which the fetal membranes were intact at the onset of labor. The chlamydial, group B streptococcal, and gonococcal infections which cause neonatal morbidity and mortality are almost always acquired during passage through the birth canal. A lack of lactobacillus sp. in the vaginal flora increases the risk of preterm birth (11). Unfortunately, attempts to remedy this deficiency by introducing lactobacillus sp. into the vagina usually produce only a transient colonization.

Routes of Infection

Most frequently, bacteria and mycoplasms reach the amniotic fluid through the cervix. The infection usually starts in the membranes adjacent to the cervical os (1, 2, 12). Inflammation is almost always present and is more advanced at this site than in the fetal membranes, the placenta or the umbilical cord. In vaginally-delivered twins, the inflammation most often involves the infant who was closest to the cervical os when only one twin is affected. This would be expected if the infection originates in membranes near the cervical os. In a few instances the bacteria or mycoplasmas that cause chorioamnionitis are introduced into the amniotic fluid by diagnostic amniocentesis, fetoscopy, intrauterine transfusion, or medically-induced abortion. It is not known how many of the infections reach the fetus via the maternal blood stream but there is speculation that this sometimes occurs via the decidua vera.

When the organisms causing the infection have low virulence, the fetal membranes often remain intact until the start of labor. In such cases, the organisms spread through the extraplacental membranes, along the surface of the chorionic cell layer, to reach the placenta within 12 to 24 hours after the infection has started near the cervical os (13). Bacteria are presumably shed into the amniotic fluid during this period.

Course of Infection

Fetal neutrophils in the umbilical vessels are often attracted by chemotactic substances in the amniotic fluid and migrate toward the amniotic cavity. Neutrophils sometimes also infiltrate the cord from the amniotic fluid. The first neutrophil migration takes place out of the umbilical vein. Only much later do the neutrophils attach to the endothelium of the umbilical arteries and migrate into the wall. When this latter process occurs, perinatal mortality is much greater than when only the umbilical vein is infiltrated. Unfortunately, even when the chorioamnionitis is severe, some segments of the umbilical cord may be unaffected, so the absence of funisitis does not rule out the diagnosis of chorioamnionitis. In some cases, neutrophils can also be absent in many areas of the extraplacental membranes. Every effort should be made to find such neutrophils when there is edema between the amnion and the chorion in the fetal membranes. The finding of even a few neutrophils in the edematous areas is almost always an indication that acute chorioamnionitis was present. In fact, it is unusual to find edema in this location without finding chorioamnionitis in the chorionic plate of the placenta. The edema often separates the amnion from the chorion, so that the amnion sometimes appears without the chorion on microscopic slides and is erroneously assumed to be the complete membrane. The presence of neutrophils in the decidua capsularis is not always associated with acute chorioamnionitis. It often occurs with foci of decidual necrosis that are unrelated to chorioamnionitis. Such foci are quite common in the decidua capsularis in late gestation and have no recognized clinical significance.

The standard for making a diagnosis of acute chorioamnionitis is the finding of neutrophils attached to or infiltrating the chorionic plate of the placenta.