



Placental Pathology and Obstetric Outcome

By David A. Schwartz, MD, FCAP

Poised on the brink of a new millennium, and despite technical advances in fetal monitoring, ultrasonography, and intrauterine diagnostics and interventional treatment, the occurrence of poor obstetric outcomes still remain a serious problem in the United States. In many cases, the causes of stillbirth, cerebral palsy, intrauterine growth retardation, and hypoxic injury are unknown, leaving obstetricians and family members without an explanation for these catastrophic occurrences.

The placenta is the largest fetal organ and is critical for all aspects of pregnancy, from implantation to delivery. To the placental pathologist, this organ provides a sensitive and specific scientific method for evaluating the nature, extent and timing of injuries to both the fetus and mother, and for excluding pre-existing injuries as well. In cases of stillbirth, placental examination is often a more sensitive technique than autopsy in determining the underlying cause(s) of intrauterine death and the duration of death prior to delivery.

Placental pathologic findings are direct evidence, obtained from microscopic examination of fetal tissues from the largest of fetal organs, and should be considered to have the same diagnostic power as does a biopsy or resection specimen in the diagnosis of diseases of adult patients. This is in contrast to some other tests of fetal well-being which can only provide indirect evidence. When expertly prepared and clearly presented, photomicrographs of placental lesions provide lucid and compelling evidence of the etiology and extent of intrauterine disease that can be understood by non-pathologists.

Some examples of significant pathological lesions of the placenta include:



Thromboembolic Disease

The increasing recognition of the significance of acquired and congenital defects of coagulation accessory factors, termed the thrombophilias, has led to greater attention focused on identifying thromboembolic disease involving the placental vasculature. Thrombi and emboli affecting the chorionic circulation are of great potential significance in explaining the occurrence of some cases of poor fetal outcome. The fetal circulation of the placenta is in direct continuity, through the umbilical vessels, with the fetus. A thromboembolic process that occurs in the chorionic or umbilical circulation is, by definition, occurring in the fetal circulation. Diagnosis of this process in the placenta is generally accepted to represent unequivocal evidence of a fetus with an abnormal coagulopathic state. It does not require a great leap of faith to recognize that a similar process may be occurring within the vasculature of the fetal body as well. Thromboembolic disease in the fetus can result in a devastating spectrum of intrauterine injuries

— continued on page 2



including irreversible ischemic damage to the central nervous system and other systems. Timing and duration of this process can often be accomplished based upon the presence or absence of other pathological placental lesions.

Fetal Thrombotic Vasculopathy

The microscopic finding of fibrotic and avascular chorionic villi, occurring in a vascular distribution, is evidence of prior occlusive disease of a larger chorionic vessel. This finding, termed fetal thrombotic vasculopathy, often accompanies chronic thromboembolic disease. As the chorionic villi undergo progressive ischemic degeneration, the approximate timing of the vascular injury can often be evaluated. It can take several weeks for the affected chorionic villi to undergo complete fibrosis and vascular obliteration.

Uneven Accelerated Villous Maturation

The occurrence of regions of the placenta containing shrunken and degenerated chorionic villi (accelerated maturation), alternating with areas of normal-sized chorionic villi, is termed uneven accelerated villous maturation. It results from abnormalities in the maternal spiral arteries that supply the intervillous space with blood. These vascular abnormalities may result from stenoses or vasospasm. When occurring over a period of several weeks, those chorionic villi in placental regions supplied by a narrowed or intermittently vasospastic maternal artery undergo progressive degeneration, resulting in a decreased ability to supply the fetus with oxygen and nutrients. This disease is often the result of maternal hypertension, but in many cases the underlying maternal cause of spiral arterial abnormalities is unknown. Uneven accelerated villous maturation is associated with poor obstetric outcome, chronic hypoxia, and IUGR, and is a classical pathological finding in cases of “chronic placental insufficiency.”

Infection

The value of placental pathology in diagnosis of a wide variety of infectious diseases is well-recognized. It confirms the obstetrical diagnosis of chorioamnionitis and is essential in detecting maternal blood-borne infections that cause villitis. The most common type of villitis, termed villitis of unknown etiology or VUE, can only be diagnosed by microscopic examination of the placenta. Although VUE can be found in placentas from healthy neonates, some cases of VUE are associated with poor obstetrical outcomes and even stillbirth. Necrotizing VUE occurs in a small percentage of VUE cases, and even though the cause or causes are unknown, it is a significant pathological risk factor for poor outcome.

Recent evidence has shown abnormally high levels of circulating cytokines, including interleukins (II-1,6,8 and 13) and tumor necrosis factor- α (TNF- α), as well as antibodies to antithrombin III, proteins C and S, and a translational product of factor V leiden mutation, are present in the blood of neonates with cerebral palsy. These findings provide emerging evidence of a possible relationship between inflammation, coagulation abnormalities, and cerebral palsy, and heighten the importance of placental pathological demonstration of infection or coagulopathy in cases with poor obstetrical outcomes.

Chorangiosis

The occurrence of capillary hyperplasia in the chorionic villi is a pathological finding indicative of long-standing and significant fetal hypoxia. It is a compensatory mechanism for increasing oxygen delivery to a hypoxic fetus by increasing the villous vascular surface area available for absorption of oxygen from maternal blood in the intervillous space. Because it represents a true architectural change in the villous vasculature, it takes at least several weeks for full-blown chorangiosis to occur. Prior to the development of full-blown chorangiosis, there is a spectrum of villous hypervascularity that represents “emerging” or “incipient” chorangiosis. This lesion results from fetal hypoxia in the same manner as does full-blown chorangiosis, although it is not microscopically as well developed and is present for less time. Chorangiosis and incipient chorangiosis are ominous, highly specific and sensitive indicators of chronic fetal hypoxia, and meticulous examination of placental tissue will often reveal the underlying etiology of hypoxic injury.

DISCUSSION

In addition to the placenta being a “diary of intrauterine fetal life,” placental pathology can also demonstrate the occurrence, severity and duration of a wide variety of conditions affecting the mother. Chronic, acute and intermittent decreases in maternal blood flow to the placenta can result in fetal damage and even death. Placental examination can demonstrate the occurrence of a wide variety of maternal diseases during pregnancy, including diabetes, hypertension, autoimmune disorders, neoplasia, hematopoietic diseases and coagulopathies, and infections to name just a few. In addition to these major pathologic categories, many other insults, such as placental separation, umbilical cord abnormalities, trauma, and hemorrhage can often be detected by placental examination. The molecular effects of maternal cigarette smoking on the uterine and fetal vasculature and blood flow are under intensive investigation, and it is becoming obvious that tobacco

use during pregnancy can have a more subtle effect on the placenta and fetus than just abruption. It can also produce placental signs of hypoxia that are evident on pathological examination.

Unfortunately, too often the placenta is never submitted for pathologic examination. This is unfortunate because once this fetal specimen is discarded, the type of information which it can contain is irretrievably lost, and cannot be duplicated by any other manner of testing. The importance of submitting the placenta when there is any indication or even suspicion of a suboptimal obstetrical outcome, or when there is maternal disease, cannot be over-emphasized. Many of the significant placental findings are focal in nature, and consequently the probability of finding such lesions microscopically increases with the number of sections sampled by the hospital pathologist. There is wide variation in the thoroughness with which placentas are sampled and interpreted in pathology departments.

Thus, in those cases of suspected fetal injury, it is a good idea for the obstetrician to notify the

pathologist of the clinical situation and request that a minimum of four to five additional sections of placenta be sampled beyond those normally taken. These should include several sections from the chorionic surface including major chorionic vessels, and several from the maternal surface to include decidual vessels. The placenta is usually stored in formalin for at least one to two weeks by most pathology departments, giving the obstetrician extra time to evaluate the neonatal outcome and need to submit additional placental tissue for examination. Because not every pathologist can have expertise in every aspect of anatomic pathology, having a thoroughly sampled placenta ensures that a sufficient number of glass slides are available should consultation with an expert in placental pathology become necessary. ●

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Closed Claim Abstract: Defense Verdict of a Lawsuit

• Recommended Guidelines • Good Documentation • Physician Demeanor • Placental Pathology
By Victoria Kennedy, R.N. Senior Risk Management Consultant

Allegations

Failure to appropriately recognize nonreassuring non-stress tests that were performed and failure to intervene with an earlier delivery resulted in a brain-damaged infant.

Clinical Sequence

A 35-year-old prima gravida female presented to an obstetrician at 20 weeks gestation. During this 20 weeks she had chest x-rays and had been on numerous medications for pneumonia and chronic asthmatic bronchitis secondary to cigarette smoking. She had pulmonary function tests performed just before presenting to the obstetrician, and she was doing quite poorly from that standpoint. The information regarding the x-ray exposure she had during this time was sent to a medical physicist. It was determined that the exposure she had required no action in a pregnant patient according to the guidelines set forth by American College of Obstetrics and Gynecology (ACOG) and American College of Radiology (ACR).⁸⁸

She was followed on a normal prenatal path after her initial visit that included an amniocentesis, ultrasounds and a rapid glucose screening. She was sent to a nutritionist and was put on the requisite diet, as her glucose values were just barely

abnormal. She was followed with urine testing and was not given any further blood glucose testing. *(There were some allegations made initially that this was related to causation as gestational diabetes can have an effect on the oxygenation of the baby, however, the plaintiffs had no expert support in this regard so it became a relatively moot issue during the trial.)*

The Final Sequence of Events:

On 1/5/94, at approximately 39 weeks gestation, the patient was seen in the office at which time her blood pressure was slightly elevated 134/96. She had edema and dizziness, but it was described as pregnancy induced hypertension as opposed to preeclampsia. *(Our insured explained that pregnancy induced hypertension in an extreme state can affect vascularity and therefore affect oxygen to the fetus, but he did not opine that this hypertension had any impact on getting the fetus in trouble.)* In fact, her medical records from the referring physician before the pregnancy reflected some elevated blood pressure values which were thought to be indicative of chronic hypertension. Her cervix was thick/posterior/-3, and she was told to return to the office in two days. *(There were allegations by the plaintiff's attorney that she should have been delivered on this day since she*

was term and hypertensive, but our insured opined that the cervix was not ripe for induction and at that time there was no need to deliver.)

On 1/7/94 the patient was seen in the office and had some edema, B/P - 130/90; and trace protein in her urine. She was put on bedrest and given Aldomet 500 mg. TID. She was given two non-stress tests on this day. One test was done at 11:00 a.m. and was noted as being reactive under the technical definition. Another non-stress test was given in the afternoon at 2:30 p.m. which was neither reactive nor nonreactive, and therefore, according to the physician, it was all right to accept the first strip for another day or two. Our insured explained that since she had acoustic stimulation with the second test, it interfered with the baseline and therefore precluded the accuracy of the second test. She was told to return in two days for another non-stress test and the plan was to continue this pattern of monitoring.

On 1/9/94, the patient presented for another non-stress test which was nonreactive, and she was sent immediately to the hospital for a contraction stress test (CST). There was still no sense of urgency on the part of the physician as it was felt that a CST was primarily a rough measure of fetal reserve, and the patient **was not** in labor. When the result of the CST was positive, a biophysical profile was done to make a definitive assessment of the fetal condition and a result of 2 was noted. The patient was taken immediately for a C-section. According to the operative note, a depressed male infant was delivered with a heartbeat but no respirations and was flaccid and pale. The initial apgars were 0 and the resuscitation team was present at delivery. The obstetrician noted in the medical record that the baby had thick meconium, which did not appear fresh. The placenta appeared heavily calcified and very thin, and it was difficult to obtain cord blood. The diagnosis by the neonatologist was neonatal asphyxia with encephalopathy (moderate).

Two obstetricians were named defendants in the case. One was the plaintiff's primary care physician, and the other was on-call during her delivery.

Issues Brought Out at Trial

The plaintiff claimed to have quit smoking at the time she had been diagnosed and treated for the chronic asthmatic bronchitis and pneumonia, but there was some evidence that indicated she had continued to smoke throughout the pregnancy. There was an expert obstetrician who testified that smoking and her chronic lung disease were

contributory to the infant's problems due to the chronic hypoxic environment that he had during the pregnancy.

The chronic hypoxic environment opinion by the expert obstetrician was bolstered by testimony from an expert placental pathologist. He opined that the fetus' placenta showed evidence of chronic thromboembolic disease. In addition, the placenta showed evidence of increased vascular surface area, maximizing its ability to extract the limited oxygen from the maternal blood by growing and perfusing new capillaries in the villi. This compensatory process increases oxygen transport to the fetus in an hypoxic environment. According to the pathologist, this evidence of a concerted and long-term effect to increase placental vascular surface area, led to the opinion that the fetal supply of oxygen was consistently and alarmingly low. The placenta had severe "chorangiosis" which is a true architectural change in the placenta that takes at least three to four weeks to make a full-blown presentation like the plaintiff's.

The plaintiff's whole case for causation was based on the idea that the problems encountered by the infant at delivery were caused by **an acute event** that took place during the two to four days prior to delivery and that had the obstetrician induced labor and delivery or C-section sooner there would not have been any brain damage. While the experts for the defense could not rule out an acute event during the days prior to the delivery, it was opined that an acute event would have been an overlay and an addition to the chronic problems that had already occurred throughout the pregnancy.

The physician's testimony and treatment rendered reflected that they had followed ACOG's recommended protocol for this situation in 1994. The testing performed along with the time increments involved to evaluate the baby for distress prior to the onset of labor were appropriate. Once the testing was completed, a C-section was performed. The baby had a bad outcome, but it was not due to negligent care.



DISPOSITION OF THE CASE - JURY TRIAL - DEFENSE VERDICT - No Appeal Filed

Reasons cited by the jury as significant for a defense verdict on behalf of the two physicians:

1. There was good documentation to support the sequence of events, and the physicians maintained some of the non-stress test strips as a part of the medical record to validate their decisions.
2. The care and treatment given to the patient was the same as the recommended treatment outlined by the American College of Obstetricians and Gynecologists for that period of time.
3. There was strong expert testimony by an obstetrician, coupled with a placental pathologist, to support the identified theory that the baby's outcome was due to a chronic hypoxic environment and chronic thromboembolic disease and chorangioma.
4. The jury indicated they found our insured physicians to be very believable, and they felt that both physicians had given the patient the best possible care and treatment, and the bad outcome was not the physician's fault.
5. The jury did not believe the plaintiffs and felt that the patient had contributed to the problem by continuing to smoke during the pregnancy especially when she had a chronic pulmonary condition that compromised her pulmonary function to begin with.

RISK MANAGEMENT DISCUSSION POINTS

Documentation: In a malpractice lawsuit, the patient's medical record testifies to the quality of care that was provided. Its importance in the courtroom cannot be emphasized enough. The medical record is considered trustworthy because entries are made contemporaneously with the care and treatment provided. Juries overall will assume that the information in the medical record is true and although this presumption can be challenged in court, it is hard to rebut. **Not only was there good documentation in this patient's medical record that clearly outlined the sequence of events, but the physicians SAVED SOME OF THE NON-STRESS TEST STRIPS AS PART OF THE RECORD which was important to the defense of this case.**

National Accepted Practice Guidelines: If a doctor practices as a specialist, the doctor will be held to the standard of care and skill of the average qualified member of the profession practicing the specialty, taking into account the advances of the profession. The doctor must keep abreast of progress in the profession and utilize accepted and recognized methods of diagnosis and treatment. All physicians are obligated to exercise their best judgment, as a physician, in the care and treatment of the patient. **The physicians followed all the accepted guidelines outlined by the American College of Obstetrics and Gynecology in 1994, with regard to the various tests performed and the timing associated with all the tests.**

Placental Pathology: The placenta should be submitted for pathological evaluation in all cases where there is:

1. maternal clinical disease,
2. any indication or suspicion of suboptimal obstetrical outcome,
3. little or no prenatal care,
4. maternal substance use,
5. multiple gestation or
6. previous history of poor obstetric outcome or spontaneous abortion.

It is also important that the placenta be liberally sampled by the pathology department to ensure that multiple microscopic sections are available for examination.

Demeanor of the Physician: The physician's presence and believability may have a significant impact with a jury. While juries are charged with the law when they deliberate to come up with a verdict, the physician's overall demeanor is extremely important. Remember that the jury will ultimately decide the case, and it is the physician's job to convince the jury of the correctness of his/her testimony. It is important to communicate your expertise clearly, concisely, and understandably, but without being condescending or arrogant. **At the conclusion of the case, the jury related that they believed the physicians and that the physicians had given the best care and treatment possible to the plaintiff. While they were empathetic with the plaintiff and the bad outcome of the baby, they did not feel it was the fault of the physicians.**

REDUCING YOUR OFFICE'S MALPRACTICE RISKS 2000

AGENDA

Registration – 11:30 a.m.
Lunch – 11:30-12:00 p.m.
Seminar – 12:00-2:00 p.m.

TOPICS INCLUDE

- Why Patients Sue • Changing Liabilities
- The Defensible Medical Record • Telephone Communication and Documentation
- Causes of Most Frequent Medical Office Claims • Confidentiality

FACULTY

Robert V. Bean - *Vice President, Risk Management*
Victoria Kennedy, R.N. - *Senior Risk Management Consultant*
Georgette Samaritan, R.N. - *Senior Risk Management Consultant*
Bettye Scrutchin, R.N. - *Risk Management Consultant*

ALABAMA

Thursday, April 13
Mobile • Country Club of Mobile

Thursday, June 8
Huntsville • Hilton Hotel

FLORIDA

Wednesday, April 12
Tallahassee • Turnbull Conference Center

Thursday, April 13
Jacksonville • Holiday Inn Baymeadows

Tuesday, August 15
Gainesville • Sheraton Hotel Gainesville

NORTH CAROLINA

Wednesday, April 5
Charlotte • Adams Mark Hotel

Tuesday, June 20
Greenville • Hilton Hotel

Tuesday, September 26
Raleigh • Research Triangle Park
Marriott Hotel

GEORGIA

Thursday, May 11
North Atlanta • Marriott Century Center

Wednesday, June 14
Tifton • Rural Development Center

Tuesday, July 18
Macon • Hotel Crowne Plaza

Thursday, August 24
Athens • Civic Center

Thursday, October 12
Savannah • Marriott Riverfront

Tuesday, November 7
South Atlanta • Ramada Plaza Hotel

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please call MAG Mutual Insurance Company
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Seminar Coordinator, Lora Walker
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