vol. XXVI, no. 4
October/November/December 2005

The Iowa PERINATAL Letter

Eclampsia

Eclampsia is the association of convulsions or coma with hypertension and proteinuria (preeclampsia) during the second half of pregnancy or the early puerperium. It causes significant maternal and perinatal morbidity and mortality. As a medical student, I was taught that eclampsia represented a "grievous failure of antepartum care." Antepartum (or prenatal) care was advocated nearly a century ago for the purpose of detecting preeclampsia and effecting delivery, thereby preventing the development of eclampsia and its consequences. Eclampsia still occurs and, as will become apparent, is often not preventable and therefore, does not necessarily represent "a grievous failure of care."

If we were able to prevent *preeclampsia*, eclampsia would not become an issue. Unfortunately, we are unable to do this. Recent attempts with low dose aspirin and calcium supplementation have not been successful. If we cannot prevent preeclampsia, then our goal is to identify it in a timely fashion through prenatal care. The reason that prenatal visits are closer together in late pregnancy is to help make this timely identification. If all patients went through a progression from excessive weight gain, to hypertension, to proteinuria, to severe preeclampsia before seizures occurred and if this progression was slow and predictable, one could intervene and potentially prevent nearly all cases of eclampsia. Identification, hospitalization, magnesium sulfate, and delivery are effective and most potential cases of eclampsia are prevented. As we shall see, however, this is not uniformly the case.

Does magnesium sulfate work?

It does. Magnesium sulfate was used empirically to treat eclampsia and to prevent seizures in women with preeclampsia for several decades before solid evidenced-based information was available. When magnesium sulfate was compared with sedatives or anticonvulsants in women with eclampsia, the rate of recurrent seizures was approximately halved (23% to 9.4%—*Obstet Gynecol* 2005; 105:402-10). Maternal deaths were also significantly reduced in those receiving magnesium sulfate (3% versus 5%).

Other studies indicate that magnesium sulfate is effective in preventing eclampsia in women with severe preeclampsia, but the overall rate of eclampsia is low. In these studies, about 1% of the patients receiving magnesium sulfate developed seizures versus 2 to 3% of those receiving no therapy.

There have been small trials in women with mild preeclampsia which do not demonstrate efficacy of magnesium sulfate in seizure prophylaxis, however, the number of patients enrolled in these studies is much too small to permit one to draw any conclusions. Although our practice is to utilize magnesium sulfate in labor in women with mild preeclampsia, some make the case that this may not be necessary.

Non-preventable eclampsia

Despite appropriate care to identify preeclampsia and appropriate management of preeclampsia, eclampsia still occurs. Why? Two decades ago, a study from Tennessee looked at eclampsia and its preventability (*Am J Obstet Gynecol* 1986; 154:581-6). One hundred seventy-nine women were studied. In two-thirds of the cases the eclampsia was considered to be preventable. In half of these "preventable" cases, the fault lay with the patient (failure to attend prenatal care) and half the time, the preventability reflected physician error. Overall, however, in one-third of the cases, there was no apparent preventability. Reasons included: 1) the apparently abrupt onset of seizures in women who had obtained timely prenatal care and in whom things were normal at their last prenatal visits (in contrast to the slow predictable progression cited above, at time things moved too quickly to be identified even by conscientious prenatal care); 2) onset prior to 20 weeks gestation; 3) onset three days or more postpartum (when this report was written, the later postpartum onset of preeclampsia/eclampsia was not as appreciated as it is today—eclampsia may occur as late as about 10 days postpartum); 4) the occurrence in hospitalized women being observed for mild preeclampsia (no specific blood pressure level or degree of proteinuria is required for seizures to occur); and 5) seizures which occurred in women receiving

This letter is funded by the Iowa Department of Public Health, Bureau of Family Services, and is cosponsored by The University of Iowa Carver College of Medicine, Iowa City, Iowa.

magnesium sulfate. About half of those women who had seizures on magnesium sulfate and in whom magnesium levels were determined, had levels in the therapeutic range (5-8 mg percent).

The Iowa Experience

At the time of perinatal program hospital visitations over the past few years, we have looked at maternal records with a discharge diagnosis of eclampsia. Twenty-five records were reviewed. In three cases, the diagnosis was uncertain and/or there was inadequate information. The remaining 22 women with the diagnosis of eclampsia will now be considered.

One woman had recognized chronic hypertension. Six of the 22 women were teenagers. In 15 cases, the preeclampsia was considered mild or was of unknown severity; severe preeclampsia was present in seven.

Fifteen patients presented antepartum, five intrapartum, and two postpartum. Textbooks often describe half of the cases of eclampsia as occurring intrapartum or postpartum. I think our smaller percentage reflects the fact that Iowa physicians are effectively identifying women with preeclampsia, are treating with magnesium sulfate in labor, and are effecting delivery. Eclampsia is, therefore, prevented in these women.

No care deficiency or preventability was identified in 10 cases; there were care deficiencies in my opinion in 10 cases; and I remain uncertain in two patients. The latter two women presented with hypertension, headache, and no proteinuria. These women definitionally had gestational hypertension (*The Iowa Perinatal Letter*, volume 25, #2; 2004). I think it is important to distinguish gestational hypertension from preeclampsia (on the basis of the absence or presence of proteinuria) and regard preeclampsia as a much more significant process. Perhaps, if the blood pressures are high enough and headache is present, it would be prudent to give magnesium sulfate even in the absence of proteinuria. This was not done in these cases and seizures resulted. I don't think that I would have instituted magnesium sulfate in these two women, but subsequent events indicate it would have been the right thing to do.

The 10 cases without care deficiency or preventability occurred in the following circumstances. In eight women, things were fine at their last prenatal visits and the timing of the next scheduled visits was appropriate. One woman had a seizure six hours postpartum. She was on magnesium sulfate for severe preeclampsia. The final woman was admitted to rule out preeclampsia and had apparent mild preeclampsia when her seizure occurred.

Potential preventability

In 10 cases, the eclampsia was potentially preventable. In three, the deficiency resided with the patient. Two women had no prenatal care before presenting with eclampsia at 30 and 35 weeks' gestation. The third patient, 17 years old and carrying twins, was admitted to the hospital with mild preeclampsia, but signed out against medical advice. She returned after seizures occurred.

Physician errors were involved in seven cases. Two women with severe preeclampsia were in the hospital for several hours without magnesium sulfate being started. These women were distinctly hypertensive and were symptomatic. It is true that often patients in the hospital will settle down and if they are preterm, one can at times treat the pregnancy expectantly, however, if severe preeclampsia is present, it is prudent to begin magnesium sulfate therapy on admission to the hospital. If things seem improved the next day and induction of labor is not undertaken, one can discontinue the magnesium therapy and reassess.

Three physician errors involved failure of magnesium sulfate administration to women being induced for severe preeclampsia. In one patient, the induction had been underway for seven hours before magnesium sulfate therapy was instituted. She had a seizure soon afterwards. Seizures can occur at any time during labor in women with preeclampsia and, therefore, one should not wait until "active labor" before beginning magnesium prophylaxis.

The final two cases of potential preventability occurred in women with mild preeclampsia. One patient was being treated as an outpatient and the second had induction of labor performed, but magnesium sulfate was not administered. As mentioned earlier, some contend that magnesium sulfate therapy is not required in labor in women with mild preeclampsia. In my opinion, mild disease can go to severe disease very quickly and in most cases I think women with mild preeclampsia should receive magnesium sulfate in labor. This rapid change in a patient's status with mild preeclampsia is the reason that I prefer to have women with mild preeclampsia admitted to the hospital in most cases. It is for the patient with gestational hypertension that I think outpatient care with close observation is appropriate.

Since eclampsia is associated with a real risk of maternal death and adverse perinatal outcome, one must react to a patient's complaint of headache during pregnancy or in the early puerperium in a conscientious fashion. The questions that should be asked are: "What is her blood pressure? Does she have proteinuria?"

Magnesium administration

Magnesium sulfate is given intravenously as a 4 to 6 gram loading dose over 30 minutes followed by an infusion usually of 2 grams per hour. The patient is placed NPO. A Foley catheter is in place to monitor urinary output, which should be at least 100 ml in every 4 hour period. Deep tendon reflexes should be checked every 15 minutes during the loading dose and then on an hourly basis. If the urine output is less than 100 ml in 4 hours or the respiratory rate is less than 12 per minute or deep tendon reflexes are absent, a serum magnesium level should be obtained, the magnesium sulfate infusion should be stopped, and consideration should be given to administering calcium gluconate depending on the clinical circumstances. Calcium gluconate, given intravenously, is the treatment for magnesium toxicity. Ten milliliters of a 10% solution are given over a minute or two. Magnesium sulfate is a safe drug if the patient is carefully observed during its administration. Calcium gluconate should be at the bedside.

Treatment of Eclampsia

If a seizure occurs under observation, the immediate goal is to try to protect the woman. A padded tongue blade can be inserted, the side rails raised, and the patient restrained. As the seizure subsides, one assesses the airway, breathing, and circulation. The blood pressure is checked, intravenous access is established, and oxygen is administered. If magnesium sulfate is not being infused, a 6 g load can be given over a shorter time interval than usual (10-15 minutes), followed by an infusion of 2 g per hour. If the patient is receiving magnesium sulfate at the time of the initial seizure or if there are recurrent seizures, an additional 2-4 g of magnesium sulfate can be infused over 15 minutes. Diastolics over 110 are treated with hydralazine or labetalol (*The Iowa Perinatal Letter*, volume 25, #2; 2004).

Eclampsia means that delivery should be effected, but in most cases it *doesn't* mean immediately. During and immediately after the seizure, the fetus may manifest distress, but this is an ideal situation for in utero resuscitation. As the mother improves with supportive care, the fetus usually will too. If after 10-15 minutes the fetal heart rate pattern is not improving, one must consider placental abruption and move toward cesarean birth. With an improved fetal heart rate pattern (the usual circumstance) and a relatively stable mother, one can initiate induction of labor or perform a cesarean depending on presentation, gestational age, and status of the cervix.

The future

The pathogenesis of preeclampsia is an area of active investigation. Perhaps in the future, we will be able to prevent preeclampsia.

At present in Iowa, most cases of eclampsia do not reflect physician errors. Our goals should be to encourage prenatal care, to respect preeclampsia and consider hospital admission, to liberally utilize magnesium sulfate in women with preeclampsia, and perhaps be more aggressive in our response to the woman with gestational hypertension with high blood pressures, especially if she complains of headache.

— Frank J. Zlatnik, M.D.

Iowa Maternal Mortality Review

The Maternal Mortality Study Committee of the Iowa Medical Society has been in existence for more than half a century and has formally reviewed maternal deaths in the state on a periodic basis. The mechanism of review and study committee recommendations appeared in *The Iowa Perinatal Letter* in 1999 (volume 20, #4). Following a subsequent meeting, four maternal death case histories were presented in 2003 (volume 24, #1).

The committee met in April 2005, and reviewed 10 maternal deaths from October 2000 to October 2004. There were 6 "obstetric" maternal deaths and 4 "non-obstetric" maternal deaths. Eight of the deaths were judged to be non-preventable. In the other 2 cases, there was insufficient information to make a judgment. One of these involved a woman with postpartum hemorrhage (these deaths are often preventable) and the second involved a case of peripartum cardiomyopathy (these deaths are usually not preventable).

Although a sample size of only 10 precludes definitive statements, it is of interest that 5 of the 10 women were age 37 or older and that 3 of the 10 women were black. There is certainly disproportionate representation by age and race in this small sample.

In the past 20 years, the committee has reviewed 66 maternal deaths. Forty-nine of these were direct and indirect obstetric deaths and 17 were non-obstetric deaths. The latter included 4 women who died in mo-

tor vehicle accidents, 3 homicides, 2 suicides, and 3 deaths from cardiac arrhythmia. The obstetric maternal deaths are considered in the table.

Cause of Death	*Percent of Obstetric Maternal Deaths*
Pulmonary Embolism	24
Hemorrhage	16
Cardiomyopathy	12
Hypertension/Preeclampsia	10
Infection	8
Anesthetic Complications	4
Other	24

Review of the current cases brought up the issues of screening for postpartum depression (*The Iowa Perinatal Letter*, volume 22, #1; 2001) and DVT prophylaxis at cesarean delivery (*The Iowa Perinatal Letter*, volume 24, #4; 2003). Shortness of breath is a significant and serious complaint. Those of us who practice obstetrics must react to such a complaint by promptly seeing the patient, performing a careful history and physical examination, and utilizing ancillary testing (e.g., pulse oximetry, chest x-ray, spiral CT, echocardiography, etc.), as indicated, in an attempt to make the correct diagnosis so that appropriate therapy can be promptly instituted. It may be lifesaving.

— *Frank J. Zlatnik, M.D.*

32nd Annual Iowa Conference on Perinatal Medicine

When: Tuesday, April 4 & Wed. April 5, 2006
Where: Des Moines Airport Holiday Inn
Fees: $135/2 days; $100/1 day

Highlighted Topics include:

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