Role of Chelation During Pregnancy in the Lead Poisoned Patient

Mary Jean Brown

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Abstract Cultural and environmental factors can cause lead poisoning in the pregnant patient. The data regarding the reproductive risks associated with chelation during human pregnancy are sparse. Assessment of the exposure setting, including anticipatory counseling for each pregnant woman, would help assure the ideal outcome of no added lead intake.

Keywords Lead poisoning · Pregnancy · Chelation therapy · CDC guidelines · ACOG guidelines

Background

Lead poisoning during pregnancy is a very rare event in the USA [1]. A handful of women in any given year are considered for chelation therapy for lead poisoning during pregnancy. The 2007–2008 National Health and Nutrition Examination Survey indicates that the geometric mean blood lead level (BLL) of US women 15 to 49 years of age is less than 0.5 mcg/dL [2], and this level is likely even less today (Fig. 1). Yet, this success in controlling and eliminating lead sources has not been universally replicated.

Approximately, 1 % of US women of childbearing age have BLLs greater than or equal to 5 mcg/dL and lead exposure is an important issue for some subpopulations, including new immigrants and women with occupational exposure to

lead. Cultural expectations can also impact BLLs and may be difficult to control. A Mexican tradition encouraging pregnant women to ingest clay pots can result in a BLL between 15 and 45 mcg/dL. In other cases, the patient is unable to leave her contaminated environment as when lead poisoning occurs during home or nursery renovation.

Treatment and Risks

The decision to provide chelation therapy can be approached in two ways: to save the mother or to reduce fetal BLLs. To save the mother's life, 70 mcg/dL is the level at which an expert would chelate regardless of trimester. There are reports of teratogenic effects in animals during the first trimester with chelation therapy [3]. After organogenesis is mostly complete, the CDC recommends that chelation therapy for women with BLLs of 45 mcg/dL or higher should be considered [1]. The decision to treat, however, should not be limited to this blood level. It should be based on the patient's history, whether the source is known, and if that source can be removed. Severe maternal lead intoxication such as encephalopathy warrants chelation therapy regardless of the stage of pregnancy. Pregnant women with confirmed BLLs of 45 mcg/dL (meaning it has been repeated on at least two venous blood samples collected within 24 h) should be considered for chelation therapy and managed in conjunction with experts in high-risk pregnancy and lead poisoning. Reserving the use of chelating agents for later in pregnancy is consistent with the general concern about the use of unusual drugs during organogenesis. Immediate removal from the lead source is the first priority and in some cases may require hospitalization. If chelation is considered, it should be performed in an inpatient setting and again in consultation with someone with experience.

The data regarding the reproductive risks associated with chelation during human pregnancy are sparse. Most of the eight published case reports of infant outcomes report on the use of chelating agents after the first trimester, including calcium disodium EDTA (six cases), succimer (one case), and British

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M. J. Brown (✉)
U.S. Centers for Disease Control and Prevention, Atlanta, GA, USA
e-mail: mjb@cdc.gov

M. J. Brown
Harvard School of Public Health, Boston, MA, USA

Fig. 1 United States population sampling of blood lead determinations in women of childbearing age (15–49 years) [1]

anti-lewisite (one case). These cases are summarized in the CDC's guidance document [1]; pregnancy outcomes and early neurologic development were good, although elevated blood lead

Table 1 Frequency of maternal blood lead follow-up testing during pregnancy [1]

Venous blood lead level (mcg/dL) ^a	Perform follow-up test (s) ^b
Less than 5	•None (no follow-up testing is indicated)
5–14	•Within 1 month •Obtain a maternal blood lead level or cord blood lead level at delivery ^c
15–24	•Within 1 month and then every 2–3 months •Obtain a maternal blood lead level or cord blood lead level at delivery ^c •More frequent testing may be indicated based on risk factors
25–44	•Within 1–4 weeks and then every month •Obtain a maternal blood lead level or cord blood lead level at delivery ^c
45 or more	•Within 24 h and then at frequent intervals depending on clinical interventions and trend in blood lead levels •Consultation with a clinician experienced in the management of pregnant woman with blood lead levels in this range is strongly advised •Obtain a maternal blood lead level or cord blood lead level at delivery

^a Venous blood sample is recommended for maternal blood lead testing

^b The higher the blood lead on the screening test, the more urgent the need for confirmatory testing

^c If possible, obtain a maternal blood lead level before delivery because blood lead levels tend to increase over the course of pregnancy

determinations persisted at birth. Longitudinal studies done in Mexico followed women from early pregnancy and found that the children whose mothers had the highest bone or blood lead levels and the highest cord BLLs were smaller and had IQ deficits [4]. Thus, balancing the risks of adverse pregnancy outcome and the possibility of adverse neurologic development attributable to lead toxicity, with the unknown impact of chelating agents on lead mobilization and redistribution, and the postulated impact on dietary factors such as zinc is a difficult challenge. In addition, the designation “EDTA” encompasses two chelating agents, one is calcium disodium EDTA and the other one is disodium EDTA. The disodium form without the calcium is sold by online vendors. At least three deaths were associated with its use in 2003–2005 [5]. This form preferentially chelates calcium; even if hospitalized, it may be difficult to replace the calcium quickly enough to prevent morbidity and mortality.

Conclusion

Although the incidence of lead poisoning during pregnancy in the USA is low, practitioners should understand the options and risks for treatment when encountered. Cultural and environmental factors can cause lead poisoning in the pregnant patient. Assessment of the exposure setting, including anticipatory counseling for each pregnant woman would help assure the ideal outcome of no added lead intake and that no baby goes home to an environment that poses a lead poisoning threat. The American College of Obstetrics and Gynecology has published a guidance document on lead screening during pregnancy and lactation [6], which follows closely the CDC guidelines (Table 1) [1].

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Conflict of Interest None

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