Social Drug Use in the Parturient: Implications for the Management of Obstetrical Anaesthesia

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Summary

Maternal use of social drugs in pregnancy continues to increase - worldwide. Although a great deal has been learned regarding the implications of illicit drug abuse in pregnancy (cocaine, amphetamines, hallucinogens), the use of social drug in pregnancy has received far less attention. This article reviews the consequences of the social drug use in pregnancy including ethanol, tobacco and caffeine and offers recommendation for anaesthetic management of these potentially complicated pregnancies.

Key Words: Pregnancy, Social drug use, Drug abuse, Chemical dependency, Drug addiction, Ethanol, Tobacco, Caffeine

Introduction

The illicit drug abuse in pregnancy has received significant attention over the past two decades[1]. However, far too little attention has been given to the consequences of the use of "social drugs" such as ethanol, tobacco and caffeine, which are by far the most commonly abused substances during pregnancy and significantly contribute to the perinatal complications. In addition, while the deleterious effects of cocaine, amphetamines or hallucinogens on the mother and the fetus are more pronounced and easier to detect, the addiction to ethanol, tobacco and caffeine is usually subtle and more difficult to diagnose[1-4]. As a result these forms of chemical dependency may continue undetected in pregnancy significantly impacting pregnancy outcome and obstetric and anaesthetic management of these patients. This article reviews the consequences of the social drug use in pregnancy including ethanol, tobacco and caffeine and offers recommendation for anesthetic management of these potentially complicated pregnancies.

General considerations

Substance abuse is defined as "self-administration of various drugs that deviates from medically or socially accepted use, which if prolonged can lead to the development of physical and psychological dependence"[5]. This disease process often referred to as chemical dependency is characterized by periodic or continuous impaired control over drug(s) intake (despite awareness of

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adverse consequences), preoccupation with the drug(s) acquisition and distortions of mental capacity, most notably denial[6]. Most often abuse of an illicit substance is first suspected or diagnosed during medical management of another condition such as hepatitis, human immunodeficiency syndrome (HIV) or pregnancy[5,7]. Psychological personality characteristics seem to predispose to, rather than result from drug addiction[5,6]. Regardless of the drug(s) ingested and clinical manifestations it is always uniformly difficult to predict anaesthetic implications in chemically dependent patients[2, 8, 9].

The prevalence of recreational drug abuse among young adults (including women) has increased markedly over the past two decades[2, 10-13]. Nearly 90% of these women are of childbearing age[2]. Consequently it is not surprising to find pregnant women who abuse drugs, and numerous reports of cases of drug abuse in pregnancy have been published [10,13-15]. Anaesthesiologists become involved in the care of drug abusing patients either in emergency situations, such as fetal distress, or in more controlled situations, such as request for labor analgesia.

Drugs most commonly abused in pregnancy include ethanol, tobacco, caffeine, cocaine, amphetamines, opioids, marijuana, hallucinogens and toluene-based solvents. Poly-substance abuse is very common[2,15]. The majority of patients with a history of drug abuse deny it when interviewed preoperatively by anesthesiologists or obstetricians[7, 16]. A high index of suspicion for drug abuse in pregnancy, combined with non-judgmental questioning of every parturient is therefore necessary. Risk factors suggesting substance abuse in pregnancy include lack of prenatal care, history of premature labor, and cigarette smoking [2, 17]. The American College of Obstetricians and Gynecologists (ACOG) has made multiple recommendations regarding management of patients with drug abuse during pregnancy. Women who acknowledge use of illicit substance during pregnancy should be counseled and offered necessary treatment. ACOG also acknowledged that some states consider intrauterine fetal drug exposure to be a form of child neglect or abuse under the law [18].

Ethanol

Epidemiology and pathophysiology

Alcoholism is the third leading cause of death and disability in the United States. It is defined as a primary chronic disease with multifactorial etiology, which include genetic, psychosocial and environmental factors [5, 6, 19]. There are more than 15 million people addicted to alcohol in the United States alone, with women accounting for approximately 25% of this number [20]. Ethanol is the substance most commonly abused in pregnancy and many maternal and fetal complications resulting from ethanol addiction have been identified. Evidence suggests that alcohol consumption in pregnancy causes adverse fetal sequelae at any stage of fetal development and any gestational age. Unfortunately the possibility of alcoholism is often overlooked in pregnant patients, because the effects of alcohol addiction are often more subtle and more difficult to diagnose.

Diagnosis and clinical presentation

A blood alcohol level of 25 mg/dL is associated with impairment of cognition and coordination. Intoxication is usually defined as a blood alcohol level greater than 100 mg/dL[5, 21]. The intoxicating effects of alcohol parallel its plasma concentration. When compared to other commonly abused substances, the effects of alcohol addiction are often more subtle and more difficult to diagnose. Chronic alcohol consumption may result in malnutrition, liver disease, altered drug metabolism, coagulopathy, pancreatitis, esophageal varices and cardiomyopathy [6]. Acute alcohol intoxication increases gastric fluid acidity and volume with simultaneous decrease in the ability to protect the airway. If heavy alcohol ingestion is not associated with food intake, pronounced hypoglycemia may occur.

Interaction with pregnancy

No safe level of alcohol consumption in pregnancy has been established. Ethanol easily crosses the placental barrier and has well-established teratogenic properties. Ethanol consumption in pregnancy may lead to the Fetal Alcohol Syndrome (FAS), which was first described in France in 1968[22]. The incidence of FAS varies with inclusion criteria and geographical location. The syndrome involves a spectrum of symptoms including intrauterine growth restriction (IUGR), characteristic facial appearances, mental handicap, musculoskeletal, genitourinary, and cardiovascular abnormalities[7, 19, 23]. Neurotoxicity of ethanol exposure of the fetus, including myelination abnormalities and optic nerve hypoplasia, have been reported [24, 25]. Neurologic effects of ethanol appear to be mediated by its actions on the receptor for the inhibitory neurotransmitter, gamma aminobutyric acid (GABA).

The overall perinatal mortality in pregnancies complicated by heavy alcohol intake is estimated at 18%[26]. Regardless of the gestational period, alcohol causes adverse fetal effects, therefore, abstinence from alcohol appears the safest approach in pregnancy[27].

Anaesthetic management

Ethanol abusing parturients may present to labor and delivery with a variety of clinical manifestations depending on degree of chemical dependency and timing of the most recent drug intake. Physiologic dependence on alcohol is manifested as a withdrawal syndrome when the drug is abruptly discontinued or when there is a significant decrease in the intake [6, 19]. The most common and earliest manifestations of acute withdrawal include generalized tremor, hypertension, tachycardia, cardiac arrhythmias, nausea, vomiting, insomnia and confusion with agitation and hallucinations[28]. Symptoms of acute withdrawal usually begin 6 to 48 hours following cessation of alcohol consumption although delay as long as 10 days after last intake has been reported [28]. The withdrawal symptoms may be suppressed by the administration of benzodiazepines, alpha-2 adrenergic agonists or resumption of alcohol consumption. Delirium tremens is a rare, although life-threatening medical emergency in ethanol addicted parturients. Acute alcohol intoxication may pose a significant risk of pulmonary aspiration to the mother and "fetal distress" to the fetus.

Regional anaesthesia can be safely administered in parturients with a history of alcohol abuse. Contraindications include neuropathy, infection, and coagulopathy, which are usually encountered in end-stage disease[6, 19]. The intravascular fluid volume must be optimized prior to induction of regional anaesthesia to avoid adverse consequences of sympathetic blockade. Preexisting neurologic impairment should be documented to avoid future litigation.

If general anaesthesia is deemed necessary, associated hepatic dysfunction, hypoalbuminemia and cardiac failure may require appropriate dose adjustments of intravenous induction agents. Chronic use of alcohol is usually associated with resistance to the actions of CNS depressants. However, suggestions that chronic ethanol consumption necessitates increased requirements of barbiturates have not been confirmed[29]. Similarly the use of excessive concentrations of potent inhaled anaesthetic agents can lead to cardiovascular depression. To the contrary, acutely intoxicated patients require less anesthetic agents. The risk of aspiration is increased in these patients due to increased gastric fluid volume and acidity, as well as an impaired laryngeal reflexes.

Tobacco

Epidemiology and pathophysiology

Low cigarette consumption prior to pregnancy is the best predictor for smoking cessation in pregnancy. Approximately 80% of women who smoke before pregnancy continue to smoke when pregnant[30]. In a national survey in Norway 21% of pregnant women reported smoking daily

smoke. Parturients, who for various reasons are not suitable candidates for nicotine replacement therapy, may receive bupropion (an antidepressant with adrenergic and dopaminergic actions) in sustained release tablets [47]. The drug works equally well in the presence and absence of depression, suggesting that its mechanism of action is not due to antidepressant properties [48, 49].

Anaesthetic management

Cigarette smoke primarily affects the function of respiratory system. Pulmonary effects of tobacco abuse include an increase in secretions and sputum production, decrease in ciliary motility, small airway dysfunction and impairment of gas exchange [50]. In smokers, 4 to 6 weeks of abstinence from tobacco smoke is required to decrease postoperative respiratory morbidity to the level of a nonsmoker. However, any period of abstinence is recommended and as little as a few days can improve mucociliary function. In tobacco abusing patients after as little as 48 hours of abstinence, levels of carboxyhemoglobin may return toward those of nonsmokers. Cigarette smoke may affect hepatic enzyme function and alter the metabolism of induction agents used for general anaesthesia. Therefore, neuraxial anesthetic techniques seem particularly suitable for tobacco abusing parturients. Intraoperative complications resulting from tobacco abuse such as bronchospasm as well as postoperative respiratory dysfunction can be avoided with the administration of regional anaesthesia and avoidance of airway manipulation.

Caffeine

Epidemiology and pathophysiology

Caffeine is a methylxanthine found in a variety of products such as tea, coffee, cola and cocoa. Most Americans consume caffeine daily in one of its many forms. A cup of coffee, for example, contains 29 to 176 mg of caffeine depending on its strength. It has been reported that approximately 80% of women drink caffeine-containing beverages daily.

Diagnosis and clinical presentation

Clinical research indicates that withdrawal symptoms can occur when daily consumption of caffeine is abruptly interrupted[51]. The caffeine physical dependence syndrome may lead to postoperative complications such as headache, nausea, vomiting and muscular aches. Most commonly, however, abrupt discontinuation of regular daily caffeine intake will lead to anxiety, mild to moderate headache and muscle aches [52].

Interaction with pregnancy

Caffeine is readily absorbed from the mucosa of the gastrointestinal tract. It crosses the human placenta rapidly reaching concentration in the fetus similar to maternal plasma levels [53, 54]. Historically, caffeine has been implicated as a cause of spontaneous abortion, IUGR, LBW and preterm delivery. However, recent studies found no evidence that moderate caffeine use in pregnancy leads to these complications[55]. At least three cases of acute fetal arrhythmias secondary to excessive maternal intake of caffeine have been reported[56]. Fernandez et al. found a small but statistically significant increase in the risk of spontaneous abortion and LBW infants in women consuming more than 150 mg of caffeine daily [57]. Caffeine induced disturbances in the development of central nervous system such as neural tube closure in animal models (mouse) have been reported [58]. Pre-conception exposure to caffeine significantly reduced maternal fertility by the failure of blastocysts to implant in a rat model [59].

Anaesthetic management

Symptoms of caffeine withdrawal may occur during labor or in the parturient fasting before or after abdominal delivery. A significant relationship exists between daily caffeine intake prior to surgery and the incidence of postoperative headache [51, 60]. If regional anesthetic technique is selected, differentiation between post-dural puncture headache (PDPH) and caffeine withdrawal headache should be considered in patients reporting postpartum headache.

Conclusion

Maternal use of social drugs including ethanol, tobacco and caffeine in pregnancy continues to increase - worldwide. Although a great deal has been learned regarding the implications of illicit drug abuse in pregnancy (cocaine, amphetamines, hallucinogens), the use of social drug in pregnancy has received far less attention[1,2]. However, the diverse clinical manifestations of these substances combined with physiologic changes of pregnancy, and pathophysiology of coexisting pregnancy related disease might lead to significant complications and impact the anaesthetic management of these parturients. A complete understanding of physiology of pregnancy, pathophysiology of pregnancy specific disorders and anaesthetic implications of social drug abuse in pregnancy is essential to tailor a safe anaesthetic plan for these patients.

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CME MULTIPLE CHOICE QUESTIONS:

1. Which of the following is a risk factor suggesting substance use in pregnancy?
   1. First pregnancy
   2. Multiple pregnancy
   3. Advanced maternal age
   4. Lack of prenatal care
   5. Fetal macrosomia

2. Which of the following is a correct statement concerning drug use in pregnancy?
   1. It has significantly decreased over the past two decades
   2. It is not considered a form of child abuse
   3. Ethanol is the substance most commonly abused in pregnancy
   4. Cigarette smoking has not been linked SIDS
   5. Caffeine physical dependence syndrome has not been described

3. Which of the following is true regarding alcohol abuse in pregnancy?
   1. Heavy alcohol ingestion may result in hyperglycemia
   2. Heavy alcohol ingestion may result in hypoglycemia
   3. Cigarette smoking is not a risk factor for alcohol abuse
   4. Alcohol withdrawal symptoms are not suppressed by alpha-2 agonists
   5. Safe level of alcohol consumption has been established

4. Which of the following is a correct statement regarding smoking in pregnancy?
   1. Nicotine does not effect placental blood flow
   2. Smoking is not considered a form of drug abuse
   3. Low cigarette consumption prior to pregnancy is the best predictor for smoking cessation in pregnancy
   4. Metabolites of tobacco-specific carcinogen cannot be detected in neonatal urine
   5. Tobacco use in pregnancy has not been linked to IUGR

5. Which if the following is a true statement regarding caffeine consumption in pregnancy?
   1. Caffeine rapidly crosses human placenta
   2. An average cup of coffee contains 2-5 mg of caffeine
   3. Moderate caffeine consumption in pregnancy may lead to spontaneous abortion
   4. Symptoms of caffeine withdrawal do not occur during labor
   5. There is no relationship between daily caffeine intake and postoperative headache