

Ethanol and tobacco abuse in pregnancy: Anaesthetic considerations

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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 and tobacco, which are by far the most commonly abused substances during pregnancy. While the deleterious effects of cocaine or amphetamines on the mother and the fetus are more pronounced and easier to detect, the addiction to ethanol and tobacco is usually subtle and more difficult to diagnose.^{1,2,4} As a result recreational use of alcohol and tobacco may continue undetected in pregnancy, significantly affecting pregnancy outcome and obstetric and anaesthetic management of these patients. This article reviews the consequences of ethanol and tobacco use in pregnancy and offers recommendation for anaesthetic 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 chemical dependency is characterized by periodic or continuous impaired control over drug(s) intake (despite awareness of 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 labour 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 anaesthesiologists or obstetricians.^{6,16} 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 labour, and ciga-

rette smoking.^{2,17} The American College of Obstetricians and Gynaecologists (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 defined as a primary chronic disease with multifactorial etiology, which includes 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 Alcoholism is the third leading cause of death and disability in the United States.

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.

Clinical presentation and diagnosis

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 with other commonly abused substances, the effects of alcohol addiction are often more subtle and more difficult to diagnose. Acute alcohol intoxication increases gastric fluid acidity and volume with a simultaneous decrease in the ability to protect the airway. If heavy alcohol ingestion is not associated with food intake, pronounced hypoglycaemia may occur. Chronic alcohol consumption may result in malnutrition, liver disease, altered drug metabolism, coagulopathy, pancreatitis, esophageal varices and cardiomyopathy.⁶

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Interaction with pregnancy

Ethanol easily crosses the placental barrier and has well-established teratogenic properties. No safe level of alcohol consumption in pregnancy has been established. 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 throughout pregnancy.²⁷

Anaesthetic management

Alcohol abusing parturients may present in labour and for delivery with a variety of clinical manifestations depending on the 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. Pre-existing neurologic impairment should be documented to avoid future litigation.

If general anaesthesia is deemed necessary, associated hepatic dysfunction, hypoalbuminaemia 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 anaesthetic agents. The risk of aspiration is increased in these patients due to increased gastric fluid volume and acidity, as well as impaired laryngeal reflexes.

Tobacco

Epidemiology and pathophysiology

Approximately 80% of women who smoke before pregnancy continue to smoke whilst pregnant.³⁰ Low cigarette consumption prior to pregnancy is the best predictor for smoking cessation in pregnancy. In a national survey in Norway 21% of pregnant women reported smoking daily in the second trimester of pregnancy.³¹ In 1990, it was reported that more than 29% of women of childbearing age in the United States smoked cigarettes.³² Others have estimated that approximately 30% of all women smoke during pregnancy.³³

Clinical presentation and diagnosis

Cigarette smoking primarily affects pulmonary function. The irritant effect of smoke decreases ciliary motility, increases sputum production and impairs gas exchange. Tobacco smoke is composed of more than 1000 components of which nicotine, carbon monoxide and hydrogen cyanide are the most harmful. Nicotine can decrease placental blood flow due to vasoconstriction, and may contribute to development of fetal hypoxia.³⁴ The affinity of haemoglobin for carbon monoxide is 200 times its affinity for oxygen, which results in decreased oxygen delivery to maternal and fetal tissue.³⁵ Normally in non-smoking individuals the carboxyhaemoglobin concentration is less than 1%. However, in smokers, it increases significantly and can be as high as 7-10%. Smoking is associated with an increase in the rate of development of atherosclerosis. Smokers have a dramatically increased prevalence of peripheral vascular disease, coronary heart disease and a 3.5-fold increased risk of acute myocardial infarction.

Interaction with pregnancy

The effects of smoking on the fetus may be due to any of the 1000 chemical substances detected in tobacco smoke. Unfortunately, apart from nicotine and carbon monoxide very little is known about the effects of other toxins in tobacco smoke on the fetus. It has been reported that tobacco specific carcinogens found in tobacco smoke easily cross placenta and can significantly affect the fetal development. Metabolites of potent tobacco-specific carcinogen 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK) can be detected in the urine in 71% of newborns of parturients who smoked during pregnancy.³⁶ The chemical composition of tobacco smoke seems more closely related to fetal IUGR than the actual number of cigarettes smoked. Tobacco abuse in pregnancy has been associated with spontaneous abortion, IUGR, premature rupture of membranes and preterm labour. Heavy tobacco abuse has resulted in placental abruption and Sudden Infant Death Syndrome (SIDS).^{37, 38} In fact, smoking has been proven to be one of the most important preventable risk factors for SIDS.³⁹

Anatomical changes in the human placenta such as thickening of the trophoblastic basal membrane, focal necrosis and hypertrophy have been reported in parturients who smoke.⁴⁰ Functional physiologic alterations such as vascular constriction, decreased placental perfusion, and impaired oxygen exchange may occur and adversely affect fetal development and pregnancy outcome. The number of low-birth-weight (LBW) infants increases in proportion to the number of cigarettes smoked.⁴¹ Intrauterine fetal growth seems to be negatively affected not only by active smoking, but also by passive exposure to cigarette smoke.⁴² Older parturients who smoke cigarettes during pregnancy appear to be at higher risk, compared with younger women, of delivering small-for-gestational-age (SGA) or LBW infants.⁴³ Interestingly, the incidence of pregnancy induced hypertension (PIH) may be decreased in women who smoke during pregnancy.⁴⁴

Many women continue to abuse tobacco during pregnancy, de-

spite the well-documented hazardous health effects of smoking.⁴⁵ The rate of tobacco abuse in pregnancy of women between 15 and 19 years of age decreased between 1990 and 1994, but increased afterwards. Today, this age group has the highest smoking rates of all age groups. The American College of Obstetricians and Gynaecologists places strong emphasis on cessation of tobacco abuse in pregnancy. Educational and behavioural approaches and nicotine replacement therapy have been recommended for tobacco abusing parturients.⁴⁶ A transdermal nicotine patch allows pregnant women to receive nicotine without exposure to other chemicals found in cigarette 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 or 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 the 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 non-smoker. However, any period of abstinence is recommended and as little as a few days can improve mucociliary function. In tobacco abusing patients as little as 48 hours of abstinence may lead to levels of carboxyhaemoglobin returning toward those of non-smokers. Cigarette smoke may affect hepatic enzyme function and alter the metabolism of induction agents used for general anaesthesia. Therefore, neuraxial anaesthetic 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.

Summary

Maternal use of ethanol and tobacco in pregnancy continues to increase worldwide. Although a great deal has been learned regarding the implications of illicit drug abuse in pregnancy (cocaine, amphetamines, opioids), the use of social drugs in pregnancy (ethanol, tobacco) has received far less attention.^{1, 2} However, the diverse and often subtle clinical manifestations of these substances combined with physiologic changes of pregnancy, and pathophysiology of co-existing pregnancy related disease might lead to serious complications and significantly impact the anaesthetic management of these parturients.

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