TITLE: INCIDENCE OF ISCHEMIC ECG CHANGES DURING CESAREAN SECTION UNDER GENERAL ANESTHESIA

AUTHORS: CM Palmer, M.D., MC Norris, M.D., MC Giudici M.D., BL Leighton, M.D., CA DeSimone, M.D.

AFFILIATION: Department of Anesthesiology and Division of Cardiology, Jefferson Medical College, Thomas Jefferson University, Philadelphia, PA 19107

INTRODUCTION. Parturients undergoing cesarean section with regional anesthesia often complain of chest pain and shortness of breath. While traditional explanations have ascribed such symptoms to peritoneal manipulation and surgical traction, a recent report[1] correlates complaints of chest pain with precordial Doppler evidence of venous air emboli (VAE). Due to the similarity of such complaints to those of patients with myocardial ischemia, we correlated patient complaints with electrocardiographic changes.
METHODS. Sixty one ASA Class I and II term parturients undergoing elective or non-urgent cesarean section gave verbal consent and participated in this institutional review board approved study. We recorded seven lead ECG's (I,II,III,aVR,aVL,aVF,V_5) on all patients at predetermined times during the procedure; concurrently, we recorded blood pressure and any complaints offered by the parturient. A cardiologist blinded as to the nature of the procedure and patient population subsequently analyzed the ECG tracings for the presence of significant change: 1) horizontal to down-sloping ST-T segment depression of 1/2 mm or greater; 2) ST-T segment elevation of any degree; or 3) multiform or frequent premature ventricular contractions (PVC's).
Results. Forty-five patients received spinal anesthesia and 16 underwent epidural anesthesia. Overall, 34 of 61 patients (55.7%) showed significant ECG change during the procedure. Changes observed were of the following types: ST-T depression (26/34); ST-T elevation (4/34); ventricular premature contractions (2/34); T-wave inversion (1/34); and ST-T depression with T-wave inversion (1/34). Changes occurred in 27 of 45 patients under spinal anesthesia and in 7 of 16 patients under epidural anesthesia (NS). 13 of the 61 patients offered symptoms; ten patients who complained of chest pain or dyspnea exhibited concurrent ECG changes, as did two patients who complained of nausea and vomiting. One patient who complained of difficulty swallowing showed no ECG change. The association of symptoms and ECG change was highly significant ($p<0.01$). The changes occurred in nine patients prior to the time of hysterotomy (Figure 1). Leads I, aVL, and V_5 were most sensitive for detecting changes.
DISCUSSION. As previously noted, complaints of chest pain and dyspnea are common during cesarean section under regional anesthesia. The report by Malinow, et al, indicated that VAE may be frequent during cesarean delivery. Further, they ascribe the complaints of chest pain and dyspnea to VAE. The authors note that none of these patients showed any change in vital signs. VAE which are large enough to cause ECG changes of the type observed in our study commonly occur only after significant changes in heart rate, blood pressure, and other physiologic parameters[2]. The observation that 9 of 34 patients with ECG changes exhibited such changes prior to hysterotomy would mitigate against VAE as a cause of chest pain and ECG changes. The ECG changes noted in this study are characteristic of subendocardial myocardial ischemia, a recognized cause of chest pain and dyspnea. While VAE can no doubt cause myocardial ischemia, it may be merely a concurrent finding.

Pregnancy and delivery place great demands on cardiac output. Cardiac output is increased by 50% over pre-pregnancy levels at term. At cesarean section, cardiac output is in turn increased by an additional 50% over pre-delivery values[3]. Even in the face of normal coronary circulation, such transiently increased oxygen demands may exceed myocardial oxygen supply.

REFERENCES.
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Fig 1. Initial Occurrence of ECG Change