Surgery during pregnancy and fetal outcome

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As many as 2% of all pregnant women undergo surgery during gestation, but there are few reports of the effects of anesthesia and surgery on fetal outcome. The present paper presents information on 287 women who had surgery during pregnancy. Surgery during early pregnancy was associated with a significant increase in the rate of spontaneous abortion compared to the rate in a control group that did not have surgery. There were no differences in the incidence of congenital abnormalities in the offspring of women who had surgery during early pregnancy. The data suggest that elective surgery be deferred during early pregnancy to minimize potential fetal loss. (AM. J. OBSTET. GYNECOL. 138:1165, 1980.)

RESULTS obtained from a national study of health of dental personnel have recently been presented.[1] The present report specifically examines fetal outcome during an 11-year period in wives of dentists and in female dental assistants who underwent surgery and anesthesia during the first and/or second trimesters of pregnancy.

Methods

A questionnaire was mailed to 29,514 male dentists and 30,272 female dental assistants. A total of 21,634 (73.3%) of the dentists and 21,202 (70.0%) of the assistants completed the questionnaire which asked questions about anesthetic practice and exposure, health history and pregnancy history of the respondent, or, in the case of the dentists, the spouse for the years 1968 to 1978. The questionnaire additionally requested information concerning exposure to anesthetics for surgical procedures occurring during each trimester of each pregnancy.

Spontaneous abortion was defined as loss of the product of conception prior to the thirteenth week of gestation (first trimester) or during the fourteenth to twenty-sixth week of gestation (second trimester). Pregnancies terminated by therapeutic abortion were excluded. The rate of spontaneous abortion was defined as the number of cases per 100 reported pregnancies. The rate of congenital abnormality was based on the number of live-born babies with one or more abnormalities per 100 births. Skin abnormalities were excluded.

Occupational exposure to inhalation anesthetics was defined as paternal (maternal) exposure reported in the work history section of the questionnaire for the year prior to the computed date of conception. The nonexposure group was restricted to those reporting no inhalation anesthetic exposure in any of the study years prior to conception. All rates were standardized by the direct method and adjustments for significant covariates (maternal age, smoking history) were made. Standard errors for adjusted rates were computed with each cell regarded as a binomially distributed proportion and then averaging cells separately within those individual groups to estimate the adjusted rates and their standard errors. P values were computed by the Mantel-Haenszel method and a value of ≤ 0.05 was considered statistically significant.

Results

A total of 12,929 pregnancies with completed data were reported for the period 1968 to 1978. Anesthetics for surgery were administered to 187 women during the first trimester of gestation and to 100 women dur-

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Table I. Spontaneous abortion in dental wives and dental assistants

Group	First trimester		Second trimester	
	Rate*	P value	Rate*	P value
Control—no occupational exposure or surgery	5.1 ± 0.2 (8654)		1.4 ± 0.1 (8210)	
Occupational exposure only; no surgery	8.6 ± 0.5 (4088)	<0.01	2.6 ± 0.3 (3755)	<0.01
Surgery only; no occupational exposure	8.0 ± 3.4 (122)	0.01	6.9 ± 3.9 (54)	<0.01
Surgery plus occupational exposure	14.8 ± 3.2 (65)	<0.01	0 (46)	—

*Rates adjusted for maternal age and smoking history.

Table II. Congenital abnormalities in offspring of dental wives and dental assistants

Group	Rate*	First trimester	Second trimester
Control—no occupational exposure or surgery	4.5 ± 0.2 (8006)	—	—
Occupational exposure only; no surgery	5.0 ± 0.4 (3624)	—	—
Surgery only; no occupational exposure	—	3.1 ± 1.6 (103)	5.8 ± 4.2 (48)
Surgery plus occupational exposure	—	7.2 ± 3.3 (51)	2.3 ± 1.7 (46)

There were no significant differences for any group compared to the control.

*Rates adjusted for maternal age and smoking history.

ing the second trimester. Occupational exposure to inhalation anesthetics, either direct (dental assistants) or indirect (wives of exposed male dentists), was associated with a significant increase in the spontaneous abortion rate over that in the control group during both trimesters. Anesthesia for surgery during either the first or second trimester was also associated with increased fetal loss. There was no significant increase noted in the number of congenital abnormalities in children born to women who had surgery during pregnancy. Results are shown in Tables I and II.

Comment

It has been estimated that as many as 0.5% to 2.0% of all pregnant women undergo surgery during gestation for reasons unrelated to pregnancy.[2, 3] In our survey, 2.2% of the respondents had surgery during the first or second trimester of pregnancy. The potential hazards of anesthesia as related to interference with maternal and fetal physiology have been discussed by Pedersen and Finster.[4] In the clinical situation it is especially difficult to separate the effects of anesthesia from those of surgery. Several animal studies have demonstrated that acute exposure to anesthetics alone in varying concentrations at critical times during gestation can lead to spontaneous abortion or congenital abnormalities.[5-8] However, species variation, concentrations and types of anesthetic used, and duration of exposure differ from study to study, making interpretation of the results of these animal studies to human pregnancy difficult.

Despite the very large numbers of pregnant women requiring anesthesia, there have been few reports of fetal outcome. Two previous studies have considered the problem.[2, 3] In the first of these studies, 67 of 18,493 (0.36%) pregnant women underwent surgery.[3] Only 10 of these women had surgery during the first trimester of pregnancy, and in this group two fetal deaths occurred. Since one of the fetal deaths was associated with maternal death, the actual incidence of perinatal mortality associated with first-trimester surgery in this report was 1/9 (11.1%). The sole fetal death during first-trimester surgery was in a woman undergoing spinal anesthesia for appendectomy. Forty-five patients had surgery during the second trimester and fetal death occurred in five (11.1%). Four of these deaths followed Shirodkar procedures for cervical incompetence with threatened abortion. No fetal deaths were associated with any of the general anesthetics administered during the second trimester. No congenital abnormalities were noted in the offspring of women who had surgery during pregnancy.

The second study examined records of 9,073 obstetric patients, of which 147 (1.6%) had surgery during pregnancy.[2] These patients were compared to a control group of women who did not have surgery during pregnancy. In 47 cases, surgery was performed during the first trimester, and four fetal deaths (8.5%) occurred. The overall perinatal mortality rate in the control group, which included fetal deaths during all three trimesters, was 2.0%. In those women who underwent first-trimester surgery and subsequently were delivered of live-born offspring, the incidence of congenital birth defects was 9.3%. This was not significantly different from the 6.0% incidence of congenital abnormalities in children born to women in the control group. In the second-trimester surgery group, fetal deaths occurred

in 6/58 women (10.3%). Congenital defects were noted in 6/52 (11.5%) offspring of these women. Of the 18 women who had Shirodkar procedures, the perinatal mortality rate was 33.3%. This high fetal mortality rate was not unexpected considering the indication for this surgery. Of the eight patients who underwent major extraperitoneal surgery during the first trimester with the use of general anesthesia, two (25.0%) had infants with a birth defect. However, 2/11 (18.0%) patients undergoing minor surgery (cervical biopsy without anesthesia) during the first trimester of pregnancy also were delivered of term infants with birth defects. The authors concluded that no specific anesthetic agent or technique was superior with respect to fetal outcome, and that it is the indication for surgery and not the anesthetic that is the important factor in predicting pregnancy outcome.

Our data base includes information on 187 women who had surgery during the first trimester and 100 women who had surgery during the second trimester of pregnancy. In the previous studies the control groups were not separated into trimesters in which the fetal loss occurred, whereas our control groups were divided into first- and second-trimester abortions. In addition, while earlier studies were based only on hospital records of stillbirths and did not include women who aborted outside the hospital, our data include all perinatal losses. Finally, the data we report were adjusted for maternal age and for cigarette smoking, both representing factors which influence fetal outcome.[9]

We noted a significant increase in spontaneous abortions in those women who had anesthesia and surgery during the first trimester of pregnancy. Previous occupational exposure to inhalation anesthetics (minimum of 1 year preceding pregnancy) either direct, by women dental assistants, or indirect, by the wives of dentists, was also associated with increased risk of spontaneous abortion. If the mother was directly or indirectly occupationally exposed to anesthetics and also underwent surgery during the first trimester, the risk of spontaneous abortion increased almost threefold above the control.

The absolute rate for spontaneous abortion decreased during the second trimester of pregnancy, although surgical exposure during the second trimester was associated with a proportionally greater risk for fetal loss as compared to the first trimester. Since Shirodkar procedures are performed during the second trimester, several women presumably had this operation. Thus, the association between surgery and anesthesia during the second trimester in reference to fetal loss is less clear-cut. Again, as in the first trimester, occupational exposure to anesthetic gases was associated with an increase in fetal loss above the control. No spontaneous abortions occurred in the 46 women who reported occupational exposure and surgery during the second trimester. No apparent explanation is available.

As with the previous reports,[2, 3] we found no association between surgery during early pregnancy and congenital abnormalities in live-born offspring.

The mail survey approach utilized in this study has several important limitations, which include possible responder bias, inaccurate recall of events, and incomplete return rates. In addition, information as to the type of anesthetic used and the operation performed during pregnancy was not available. Despite these acknowledged shortcomings, the present study is important in that it reports fetal outcome for a large series of women who had surgery during early pregnancy. We found a significant increase in fetal losses for women who had surgery during the first or second trimester of pregnancy. Although we and others have found no increase in the congenital abnormality rate in the offspring of women who had surgery during early pregnancy, the increased fetal loss in these women prompts support to the recommendation to defer all but urgent surgery during gestation. As in previous studies, we were unable to determine whether the anesthetic, the surgical procedure, or the combination provided the cause for the increased rates of spontaneous abortion noted.

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