

Pregnancy after heart surgery – challenges

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Summary

Purpose: Advances in cardiac surgery significantly improve life expectancy and quality of life of patients with congenital or acquired heart disease. **Materials and Methods:** The present study included 146 pregnant women who had antenatal care and gave birth at the Institute of Gynecology and Obstetrics in an interval of ten years from 1994-2004. Patients were divided in four groups according to the type of heart surgery. Group I included four patients with surgically corrected coarctation of the aorta. Group II included 27 patients with correction of the ostial stenosis. Group III had 68 patients with correction of congenital heart diseases, and group IV had 47 patients with artificial heart valves. **Results:** There was 4% of heart failure after delivery. The incidence of hemorrhagic complications during pregnancy was 2.7% and 4.1% after delivery. The incidence of thromboembolic complications after delivery was 6%. Four newborns died, one of hydrocephalus and three of hypoxic ischemic encephalopathy. Two patients died. **Conclusion:** Patients with artificial heart valves need an enhanced level of medical care during pregnancy and labor.

Key words: Congenital heart disease; Heart surgery; Pregnancy; Anticoagulation therapy.

Introduction

Advances in cardiac surgery improve quality of life and level of functioning of cardiovascular system of patients with congenital or acquired heart disease. These diseases complicate from 0.1% to 4% of pregnancies. Half of them are congenital. Maternal mortality of patients with New York Heart Association (NYHA) Functional Status class III and IV is 8% [1]. Congenital heart disease includes anatomic as well as functional defects of cardiovascular system, which are the result of incorrect embryogenesis. The reasons are still unknown but infections, immunological disorders, genetics, and medications are possible risk factors. The inheritance rate is 2-10%.

In congenital heart disease heart surgery can be performed in childhood, but also any time in life, even during the pregnancy. Important point for these patients is coordinated care of cardiologist, surgeon and obstetrician in order to monitor the pregnancy and to determine the risks for mother and for fetus and minimize them.

Special group of patients are those with artificial heart valves. They receive continuous anticoagulation therapy. Therefore they are an extreme challenge for the obstetricians. Heart disease and hemodynamic changes during pregnancy place a special burden on underlying heart disease. Complications resulting in maternal death are thromboembolic, hemorrhagic, and heart failure. The fetus is in danger of hypoxia, genetics and oral anticoagulation therapy, and other medications given to the patient in order to support cardiovascular system.

The aim of the study was to analyze course and outcome of pregnancy in patients after surgical correction of congenital or acquired heart disease. Answers to many questions are still unknown. When can we advise the patient to continue the pregnancy despite the risks for mother and fetus? What anticoagulation and other therapy should be given to the patient? Which medications are safe for fetus? How frequent should these women be monitored? If necessary, what is the most appropriate time and way to terminate a pregnancy? How does the pregnancy influence the heart disease and in what way does the disease influence mother and fetus? Are all patients who had heart surgery at the same risk during pregnancy?

Materials and Methods

The present study included 146 pregnant women who had antenatal care and gave birth at the Clinic of Gynecology and Obstetrics in an interval of ten years (1994-2004). The study was prospective. The same team of obstetricians and cardiologists followed the patients. The changes in therapy principles during these years were carefully applied, especially anticoagulation therapy. Patients were divided in four groups according to the type of heart disease and the type of surgery. Group I included four patients with surgically corrected coarctation of the aorta. Group II included 27 patients with correction of the ostial stenosis. Group III had 68 patients after correction of congenital heart diseases and group IV had 47 patients with artificial heart valves. Group IV was divided in two subgroups: A - 22 patients under oral anticoagulation therapy and B - 25 patients who received heparin in the last four weeks of pregnancy and after delivery. Oral anticoagulation therapy was ethyl biscumacetate.

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All patients had regular hematological and biochemical controls every two weeks. These included: hemoglobin levels, hematocrit, red blood cells, platelets, coagulation time, and APTT or INR testing depending on the type of anticoagulants received. Fetal evaluations were made every three to four weeks and they included ultrasound examination and measurements, and biophysical profile. Labor was induced only for obstetric indications. Oxytocin was used for induction of labor. However, it was administered cautiously in a concentrated solution to avoid water overload. All patients received antibiotics for prophylaxis against infective endocarditis during labor. They were kept in a proper up position. Intermittent oxygen and analgesics were provided whenever needed. The second stage of labor was shortened, if necessary, by the use of outlet forceps or vacuum extractor. Oxytocin was used for control of postpartum hemorrhage. Women who had been on anticoagulants were restarted on heparin within four hours of vaginal delivery and eight hours of cesarean delivery. Oral anticoagulants were resumed and heparin discontinued when prothrombin time reached 1.5–2 times normal. The authors recorded maternal and fetal complications such as hemorrhage, thromboembolic complications and heart failure during the pregnancy, delivery, and puerperium. Neonatal evaluation was completed. It included gestational age, fetal weight, Apgar score, intrauterine growth retardation, anomalies, and mortality we showed periparturient and also neonatal outcome.

The present authors monitored the course of heart disease as well as the pregnancy and recorded maternal and fetal complications during the pregnancy and delivery. These included thromboembolic and hemorrhagic complications and heart failure, as well as intrauterine growth restriction, intrauterine fetal death, and fetal anomalies. They analyzed the mode of delivery and the period after it. Statistical analysis was made by Student *t*-test, Chi square, Fisher test, and analysis of variance.

Results

The average age of patients was 25 years in group I, 27.9 years in group II, 26.4 in group III, and 28.8 in group IV. Statistical analysis showed difference between the groups. (Fx was 18.6)

Mitral mechanical valve was replaced in 27 patients, 18 aortic, and two tricuspid. Thirty-six patients had one replaced valve, ten had two replaced valves, and one had three.

NYHA class of patients was I and II in majority of cases. In group II and III one patient each had class III, and in group IV, four patients. These 4% of patients came to the hospital with advanced pregnancy. Statistical analysis showed significant difference between the groups (Fx was 3.12). The worst NYHA status was in group IV. Similar data resulted for labor. Nine patients in group IV were in class III NYHA (6%)

The present authors found that 45% of patients required cardiac medications in order to support heart function. The most frequently used medications were digitalis, diuretics, and oral anticoagulants in patients with artificial heart valves. They divided the patients in group IV according to the type of anticoagulation therapy. Group A included 22 patients receiving ethyl biscumacetate during the first 36 weeks of gestation, and intravenous heparin in the last four

weeks and after delivery. Group B included 25 patients receiving oral anticoagulant therapy during whole pregnancy.

The incidence of hemorrhagic complications during pregnancy was 2.7%, all from subgroup A: one vaginal bleeding, three epistaxis, and one subcutaneous hematoma. After the delivery, the incidence was 4.1%: two patients had hematomas due to episiotomies and four had postpartum hemorrhage, all from subgroup B. One patient had total and one subtotal hysterectomy because of postpartum hemorrhage. In the case of the second patient, who unfortunately died, pathologists found ventricular carcinoma with changes in the liver which completely disturbed coagulation status. Because of small numbers, statistical analysis showed no difference.

One patient from group II had heart failure during pregnancy and six from group IV. After the delivery there was 4% of heart failure: one patient from group II and five patients in group IV. Statistical difference was significant (Fx was 2.5). The majority of heart deteriorations were in patients with artificial heart valves.

When the present authors explored factors which influenced the heart failure, they noticed that it occurred in 92% of cases in patients younger than 30 years, which was statistically significant. No significant correlation was found between NYHA class and heart failure which was unexpected. In class I and II, eight patients had heart failure (5.5%), and five patients were in class III (3.4%). Type of operation also influenced the heart failure. In 92% of cases patients had mechanical heart valves (Fx was 7.7)

Number of preterm labors differs statistically between the groups. In group I it was 25% of premature labors, in group II it was 11%, in group III it was 6%, and 23% in group IV (Fx was 2.72). The highest rate was in groups I and IV.

When the present authors analyzed the mode of delivery they noticed that 80% of deliveries were vaginal and only 8% were induced, while others were spontaneous. Cesarean sections were performed in 20% of cases. There was no statistical difference between the groups (Fx was 2). In group I, 75% of patients were delivered by cesarean section, in 18% in group II, 20% in group III, and the least percentage was 6% in group IV. The incidence of forceps was 14% and vacuum application 14%.

Four patients had thromboembolic events before the pregnancy: two had cerebrovascular attacks, and two thrombosis of the valve. Analysis of thromboembolic complications during puerperium showed that one patient had pulmonary and two had cerebral embolisms, all in subgroup A. The incidence of postpartum thromboembolic complications was 6%.

Maternal mortality rate was 2%. Two patients died due to heart failure at three and seven days after the vaginal delivery in group IV. These were uncontrolled patients who came to the hospital just before labor in serious heart conditions, hence postpartum correction was impossible.

The average neonatal birth weight was 3,000 g in group I, 2,600 g in group II, 2,800 g in group III, and 2,600 g in group IV and the difference was statistically significant (Fx was 5.1). APGAR score was less than 7 in 5.4% of cases. Statistical analysis showed influence of maternal NYHA class on Apgar score (Fx was 40.6). One-third of newborns with APGAR less than 8 were from NYHA class II and III. Cesarean section was performed in 60% of these cases. There were two cases of fetal intrauterine death (1.3%), as well as 13 cases of fetal growth restriction (8.9%).

One newborn died of hydrocephalus in group IV subgroup B (0.6%), which can be explained with teratogenic effect of oral anticoagulant therapy when administered in the second trimester causing fetal hemorrhage. One newborn from group II and two from group III died of hypoxic ischemic encephalopathy. Neonatal mortality was 2.7%. In the present study there were no fetuses with congenital heart disease.

Pregnancy in patients with NYHA class I and II after surgical correction can be allowed. Pregnancy places strain on the cardiovascular system and increases risks which are difficult to predict. At the beginning of pregnancy only 6% of patients had unsatisfactory functional status. In group I status did not change during labor and puerperium. In group II one patient changed NYHA class from III to II. In group III, two patients passed from NYHA I to II, and one from NYHA II to III. In group IV, seven patients moved from class I to II and five from class II to III. During delivery functional status changed in 15 patients (10.2%) and majority was with artificial heart valves [14].

Discussion

Four patients suffered thromboembolic events before the pregnancy and three patients during puerperium, all in subgroup A. The incidence of thromboembolic complications was 2%. This signifies that heparin did not prevent thromboembolic complications after delivery. Salazar *et al.* [2] registered three valve thrombosis and 14 cerebral embolisms in patients who received oral anticoagulant therapy with kumarin, and one patient had cerebral insult under heparin therapy. Ismail *et al.* [3] found two thromboembolic complications among 76 pregnancies who received heparin therapy.

The incidence of hemorrhagic complications during pregnancy was 2.7% and 4.1% after the delivery, all in subgroup B. The patients who received heparin during the last four weeks and after the delivery rarely suffered from hemorrhagic complications. In comparison Matoras *et al.* [4] had one postpartum hemorrhage in 59 deliveries of patients with oral anticoagulant therapy. Ismail *et al.* [3] had seven postpartum hemorrhages among 76 patients. Ayhan *et al.* [5] had 20 % and Avila *et al.* [6] 23% of hemorrhagic complications in their study.

One patient had heart failure during pregnancy in group II and six in group IV. After delivery there was 4% of heart

failure: one patient from group II and five patients from group IV. The majority of heart deteriorations were in patients with artificial heart valves. The incidence of heart failure during the pregnancy was 11% and after delivery it was 9%. Matoras *et al.* [4] had two heart failures among 59 patients. Mazhar and Gul-e-Irim [7] noticed 7% of heart failure, Malhorta *et al.* [8] 5.1%, and Sermer *et al.* [9] had 18%, and the worst prognosis were in patients with previous complications and patients under oral anticoagulant therapy.

Patients with heart disease, because of impaired circulation, have hypoxia of myometrium and tendency to premature labor. The incidence was 13%, but majority of them were in group with artificial heart valves. Bhutta *et al.* [10] found 7% of premature labors.

The mode of delivery was 80% vaginal and only 8% was induced. Cesarean sections were performed in 20% of cases. Oron *et al.* [11] reported 39% of inductions in women with heart disease and no increased rate of cesarean sections or maternal and neonatal morbidity.

One newborn had anomaly (hydrocephalus) in group IV subgroup B (0.6%), which was likely to be due to teratogenic effect of oral anticoagulant therapy when administered in the second trimester. One newborn from group II and two from group III died of hypoxic ischemic encephalopathy. Neonatal mortality was 2.7%. In the present study there were no fetuses with congenital heart disease. The authors noticed two cases of fetal intrauterine death (1.3%) and intrauterine growth restriction of 13 fetuses (8.9%). Mazhar *et al.* [7] had 5% of fetal intrauterine death, Bhutta *et al.* [10] 2%, and Kaemmerer *et al.* [12] one fetus. Kaemmerer *et al.* [11] noticed 5.4% of fetal congenital heart diseases in their study. Lupton *et al.* [13] found the inheritance rate of 2-20%. Chauczak *et al.* [14] also found increasing rate of inheritance, but increasing rate of cesarean sections as well.

Two patients died therefore maternal mortality rate was less than 2%. Mazhar *et al.* [7] found 7.1% of maternal mortality rate. Avila *et al.* [6] had lower rate of 2.7%. Bhutta *et al.* [10] found 20% mortality rate of patients with heart disease who were not operated.

Conclusions

Pregnancy should be planned according to the heart functional status. Oral anticoagulant therapy should be replaced with heparin and continued for the first 12 weeks, and the last four weeks. In the middle of pregnancy oral anticoagulants should be administered. The present authors suggest ethyl biscumacetate because it showed mild teratogenic effect. They should be monitored by the team of cardiologist, surgeon and obstetrician every three to four weeks.

The preferable way of delivery is vaginal. The present study suggests that there is no need for preterm termination of pregnancy if NYHA status allows it. After the delivery 12-24 hours, heparin should be administered and 48-72 hours

with oral anticoagulants. Worsening of functional heart status was detected in 4% of cases after delivery. Patients with mechanical heart valves were under greater risk for thromboembolic and hemorrhagic complications, heart failure, as well as for fetal anomalies compared to other patients who had heart surgery for congenital and acquired heart diseases.

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