

# Course and Outcome of Pregnancy after the Heart Surgery

Snezana Plesinac, Igor Pilic

**Abstract**—Advance in cardiac surgery significantly improved life expectancy and quality of life of patients with congenital or acquired heart disease. **METHODOLOGY:** Our study included 146 pregnant women who had antenatal care and gave birth at the Institute of gynecology and obstetrics in 10 years interval. (1994-2004). Patients were divided in 4 groups according to the type of heart surgery. Group I included 4 patients with surgically corrected Coarctation of 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 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 postpartum thromboembolic complications 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.

**Keywords**— Anticoagulation therapy, congenital heart disease, heart surgery; pregnancy

## I. INTRODUCTION

Advances in cardiac surgery improved quality of life and level of functioning of cardiovascular system of patients with congenital or acquired heart disease. These diseases complicate 0.1-4% pregnancies. Half of them are congenital. Maternal mortality of patients with NEW YORK HEART ASSOCIATION (NYHA) FUNCTIONAL STATUS class III and IV is 8%. 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 for 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, because both mother and fetus are at risk. Heart disease and hemodynamic changes during pregnancy place a special risk for deterioration of 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 following 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 to mother and fetus? What anticoagulation and other therapy which shall 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 how the disease influence mother and fetus? Are all patients who had heart surgery at the same risk during pregnancy?

## II. METHODS

Our study included 146 pregnant women who had antenatal care and gave birth at the Institute of gynecology and obstetrics in 10 years interval (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 4 groups according to the type of heart disease and the type of surgery. Group I included 4 patients with surgically corrected Coarctation of 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 47 patients with artificial heart valves. This group IV is divided in two subgroups: A- 22 patients under oral anticoagulation therapy and B- 25 patients who received Heparin in the last 4 weeks of pregnancy and after the delivery. Oral anticoagulation therapy was Ethylbiscumacetate (Pelentan).

All patients had regular hematological and biochemical testings 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 3-4 weeks and they included ultrasound examination and measurements and

Snezana Plesinac PhD, [plesinac@hotmail.com](mailto:plesinac@hotmail.com)  
Igor Pilic MD, [pilic.igor@yahoo.com](mailto:pilic.igor@yahoo.com)

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 4 h of vaginal delivery and 8 h of cesarean delivery. Oral anticoagulants were resumed and heparin discontinued when prothrombin time reached 1.5–2 times normal. We recorded maternal and fetal complications such as hemorrhage, thromboembolic complications and heart failure during the pregnancy, delivery and puerperium. Neonatal evaluation was complete. It included gestational age, fetal weight, Apgar score, intrauterine growth retardation, anomalies and mortality we showed periparturient and postnatal neonatal outcome.

We monitored course of heart disease as well as the pregnancy and recorded complications to mother and fetus that appeared during the pregnancy and delivery. These included thromboembolic, hemorrhagic complications and heart failure, as well as intrauterine growth restriction, intrauterine fetal death and fetal anomalies. Analysis was made of the mode of delivery and postpartum period.

Statistical analysis was made by Student t test, Hi square, Fisher test and analysis of variance.

### III. THE 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 is 18.6)

Mitral mechanical valve was replaced in 27 patients, Aortic 18 and 2 tricuspid. Thirty six patients had one replaced valve, 10 had two replaced valves and 1 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 in advanced pregnancy. Statistical analysis showed significant difference between the groups (Fx was 3.12). The worst NYHA status was in group IV. The similar data stands for the labor. Nine patients in group IV were in class III NYHA (6%)

We found that 45% of patients required cardiac medications in order to support heart function. The most frequently used medications were digitalis and diuretics and oral anticoagulants in patients with artificial heart valves. We divided the patients in group IV according to the type of anticoagulation therapy. Group A included 22 patients receiving Ethyl biscumacetate (Pelentan) during the first 36 weeks of gestation, and intravenous Heparin in the last 4 weeks and after the 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: 1 vaginal bleeding, 3 epistaxis and 1 subcutaneous hematoma. After the delivery

the incidence was 4.1%: two patients had hematoma of episiotomies and 4 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 5 patients in group IV. Statistical difference was significant (Fx is 2.5). The majority of heart deteriorations were in patients with artificial heart valves.

When we explored factors which influence the heart failure we noticed that it occurred in 92% of cases in patients younger than 30 years, which was statistically significant. No significant association was found between NYHA class and heart failure which is unexpected. In class I and II 8 patients had heart failure (5.5%), and 5 patients in class III (3.4%). Type of operation also influences the heart failure. In 92% of cases with it patients had mechanical heart valves. (Fx is 7.7)

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

When we analyzed the mode of delivery we noticed that 80% of deliveries were vaginal and only 8% was induced, others were spontaneous. Cesarean Sections were performed in 20% of cases. There is no statistical difference between the groups (Fx is 2). In group I 75% of patients were delivered by Cesarean section, in group II 18%, in group III 20 % and the least percentage had group IV 6%. 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 1 patient had pulmonary and 2 cerebral embolisms, all in subgroup A. The incidence of postpartum thromboembolic complications was 6%.

Maternal mortality rate is 2%. Two patients died due to the heart failure 3 and 7 days after the vaginal delivery in group IV. Those were uncontrolled patients who came to the hospital just before the labor in bad heart condition so the postpartum correction was impossible.

The average neonatal birth weight was 3000g in group I, 2600 g in group II, 2800 g in group III and 2600 g in group IV. Difference was statistically significant. (Fx is 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 40.6). One third of newborns with APGAR less than 8 are from NYHA class II and III. Cesarean Section was performed in 60% of these cases. There were 2 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 2 from group III died of hypoxic ischemic encephalopathy. Neonatal mortality is 2.7%. In our study there were no fetuses with congenital heart disease.

There is no contraindications for pregnancy to the patients with NYHA class I and II after surgical correction. Pregnancy puts strain on the cardiovascular system and consequences at times hard to predict. At the beginning of pregnancy only 6% of patients had unsatisfactory functional status. In group I status has not changed 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 7 patients moved from I to II class and 5 from II to III class. During delivery functional status changed in 15 patients (10.2%) and majority was with artificial heart valves.

#### A. DISCUSSION

Four patients suffered thromboembolic events before the pregnancy and 3 patients during puerperium, all in subgroup A. The incidence of thromboembolic complications was 2%. That means that Heparin did not prevent thromboembolic complications after delivery. Salazar [3] registered 3 valve thrombosis and 14 cerebral embolisms in patients who received oral anticoagulant therapy with Kumarin, and 1 patient had cerebral insult under Heparin therapy. Ismail [4] found 2 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 suffer from hemorrhagic complications. In comparison Matoras [5] had one postpartum hemorrhage in 59 deliveries of patients with oral anticoagulant therapy. Ismail [4] had 7 postpartum hemorrhages among 76 patients. Ayhan [6] had 20 % and Avila [7] 23% of hemorrhagic complications in his study.

One patient had heart failure during pregnancy in group II and 6 in group IV. After the delivery there was 4% of heart failure: one patient from group II and 5 patients in 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 the delivery was 9%. Matoras [5] had two heart failure among 59 patients. Mazhar [1] noticed 7% of heart failure and Malhorta [2] 5.1% Sermer [8] had 18% of it and the worst prognosis had 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 of it was 13%, but majority of them were in group with artificial heart valves. Bhutta [9] 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 [10] 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 is likely to be due to teratogenic effect of oral anticoagulant therapy when administered in the second trimester. One newborn from group II and 2 from group III died of hypoxic ischemic encephalopathy. Neonatal mortality was 2.7%. In our study there were no fetuses with congenital heart disease. We noticed 2 cases of fetal intrauterine death (1.3%) and intrauterine growth restriction of 13 fetuses (8.9%). Mazhar [1] had 5% of fetal intrauterine death, Bhutta [9] 2% and Kaemmerer [11] 1 fetus. Kaemmerer [11] noticed 5.4% of fetal congenital heart diseases in his study. Lupton [12] found the inheritance rate of 2-20%. Chaupezcak [13] 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 [1] found 7.1% of maternal mortality rate. Avila [7] had lower rate of 2.7%. Bhutta [9] found 20% mortality rate if patients with heart disease who were not operated.

#### REFERENCES

1. Mazhar SB, Gul-e-Irim. "Fetomaternal outcome in pregnancy with cardiac disease". J Coll Psysician Surg Pak 2005;15(8):476-80.
2. Malhorta M, Sharma B, Arora P, Batra S, Sharma S, Arora R. "Mitral valve surgery and maternal and fetal outcome in valvular heart disease". Int J Gynaecol Obstet 2003; 81(2):151-6.
3. Salazar E, Zajarias A, Iturbe I et al. "The problem of cardiac valve prostheses, anticoagulants and pregnancy". Circulation 1984; 70:1169-1177.
4. Ismail M, Abid F, Trabelsi S et al. "Cardiac valve prostheses, anticoagulation and pregnancy". Br Heart J 1986; 55:101-105.
5. Matoras R, Reque JA, Larrea L et al. "Prosthetic heart valve and pregnancy". Gynecol Obstet Invest 1985; 19:21-31.
6. Ayhan A, Japar EG, Nazbi N et al. "Pregnancy and its complications after cardiac valve replacement." Int J Gynecol Obstet 1992; 35:117-122.
7. Avila WS, Ross EG, Ramires JA et al. "Pregnancy in patients with heart disease experience with 1000 cases". Clin Cardiol 2003; 26(3):135-42.
8. Sermer M, Colman J, Siu S. "Pregnancy complicated with heart disease: a review of Canadian experience". J Obstet Gynaecol 2003; 23(5): 540-4
9. Bhutta SZ, Aziz S, Korejo R. "Pregnancy following cardiac surgery". J Pak Med Assoc 2003; 53(9):407-13.
10. Oron G, Hirsh R, Ben-Haroush A et al. "Pregnancy outcome in women with heart disease undergoing induction of labor". BJOG 2004; 111(7):669-75
11. Kaemmerer H, Bauer U, Stein JI et al. "Pregnancy in congenital cardiac disease an increasing challenge for cardiologist and obstetrician-a prospective multicenter study". Z Kardiol 2003;92(1):16-23.
12. Lupton M, Oteg-Ntim E, Ayido G, Steer PJ. "Cardiac disease in pregnancy". Curr Opin Obstet Gynecol 2002; 14(2):137-43.
13. Chaupezcak [13] also found increasing rate of inheritance, but increasing rate of Cesarean Sections as well.

13. Chaupczak P, Kolaska -Kloch W, Jach R, Basta A.  
“Pregnancy in patients with heart disuse“. Clin Exp Obstet  
Gynecol 2004; 31(4):271-3.
14. Plešinac S. Plećaš D. Pilić I. Babović I.  
“Anticoagulation therapy during pregnancy of  
patients with artificial heart valves:  
fetomaternal outcome“. Arch Gynecol Obst.  
2006. June 274(3):141-145.