Successful Pregnancy and Childbirth in a Patient with Diabetic Kidney Disease Receiving Hemodialysis

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Pregnancy outcomes for women uncontrolled diabetes mellitus are poor. Women with chronic kidney disease and end-stage renal disease, if pregnant, will develop pregnancy-related complications. In the case of severe renal failure and diabetes mellitus, the incidence of prematurity, low birth weight, and neonatal death increases. Despite these risks, there have been few reported cases of successful pregnancy outcomes for these women. Adherence to a schedule of strict glucose monitoring, blood pressure and volume control, correction of anemia, and intensive hemodialysis may play important roles in the management of these women. Successful pregnancy and childbirth in a patient with diabetic kidney disease receiving hemodialysis have not been previously reported in Korea, to our knowledge. Herein, we report a case of a successful pregnancy outcome in a patient with diabetic end-stage renal disease undergoing hemodialysis.

Keywords: Pregnancy; Diabetes mellitus; Renal dialysis

INTRODUCTION

Pregnancy is uncommon in women with chronic kidney disease because of disorders in ovulation and menstruation and decrease in libido. Successful pregnancy and delivery rarely occur in the patients undergoing hemodialysis (HD) due to high blood urea nitrogen level [1]. In chronic kidney disease patients, average gestational age of the fetus is 33 weeks, and average fetal birth weight is 1.8 kg; further, the peripartum fetal death rate is higher than that in the general population due to polyhydramnios caused by uremia [2]. In 1973, Unzelman et al. [2] first reported a case of successful pregnancy and delivery in a patient who had received hemodialysis for 4 years; the fetus was healthy and weighed 1,570 g. In Korea, some centers have reported that the patients who have undergone kidney transplantation [3] and received HD [4] have experienced successful pregnancy and birth.

Diabetes mellitus (DM) in a pregnant woman can be detrimental to her fetus. First, diabetic women have increased spontaneous abortion rate compared with the rate in nondiabetic pregnant women. Second, the prevalence of major congenital anomalies is 6% to 8% in the newborns of type 1 diabetic women, whereas this prevalence is 2% in newborns of nondiabetic women [5]. The major malformations involve neural tube defects and cardiac anomalies; affected tissues are formed during the early part of the first trimester period of organogenesis. The other negative consequences that DM may have on a fetus are macrosomia and certain neonatal mortalities, such as respiratory distress syndrome, hypoglycemia, hyperbilirubinemia, and hypocalcemia [6]. Therefore, any dialytic woman who is of childbearing age should be informed of the risks of pregnancy. Furthermore, more detailed pre-pregnancy counseling and care are required. Fortunately, since the advent of insulin therapy, the rates of maternal morbidity and mortality have decreased. Recently, one center reported the case of a type 1 diabetic nephropathy patient who had a successful pregnancy and delivery using an insulin pump [7]. Thus, some centers reported successful cases about DM patients on HD [8]. In Korea, our center experienced a case of a successful pregnancy outcome in a patient with diabetic end-stage renal disease undergoing hemodialysis.
We report the case of a 29-year-old woman with DM and end-stage renal disease who was managed antepartum with regular intensive HD; strict control of blood glucose, blood pressure, and blood volume; and correction of anemia.

**CASE REPORT**

A 29-year-old Korean woman who was diagnosed with type 1 DM began insulin therapy when she was 10 years old. She subsequently developed end-stage renal disease at the age of 22 years and was placed on HD for 3 to 4 sessions per week. She had had irregular menses for several years, and her last known menstrual period was 6 months before admission.

When she was admitted to the nephrology department because of pregnancy, her blood pressure was 150/100 mm Hg although she was taking hypertensive medications. Her pulse rate was 68/min; respiration rate, 20/min; body temperature, 36.5°C; and body weight, 53.9 kg. Laboratory assessment showed that hemoglobin was 11.4 g/dL; hematocrit, 35.8%; blood urea nitrogen, 27.4 mg/dL; and creatinine, 6.6 mg/dL.

**1. Maternal State**

The patient had persistent uncontrolled blood pressure of 200/100 to 150/80 mm Hg before and during pregnancy, despite the use of anti-hypertensives (calcium channel blocker and angiotensin receptor blocker). After knowing her pregnancy, we decided to control blood pressure by increasing HD session 5 sessions per week and changing anti-hypertensives into only calcium channel blocker. Subsequently, her blood pressure was lowered to 160/90 to 140/80 mm Hg.

Before pregnancy, the patient’s dry weight was 43 kg and was gradually increasing during pregnancy. At delivery, her dry weight was 48.5 kg. The difference in dry weight was approximately 5.5 kg. Before pregnancy her inter-dialysis weigh change was 3.5 to 4.5 kg, but during pregnancy inter-dialysis weight change was 2.5 to 3.5 kg using increasing HD session. Before pregnancy, her blood glucose levels were poorly controlled with the injection of insulin lispro (on HD days, 13 IU; on non-HD days, 26 IU). However, during pregnancy, tight glycemic control was required to maintain maternal and fetal health; therefore, she received diet education and the injection of human insulin NPH/RI (on HD days, 25 IU/5 IU; on non-HD days, 10 IU/5 IU). Before intensive insulin therapy, her hemoglobin A1c (HbA1c) had been 12.0%, but after treatment, her HbA1c was 7.5%.

In the second trimester, her hemoglobin was temporarily < 8 g/dL but increased to 10.0 g/dL by increase of IV erythropoietin dose (3,000 IU/wk to > 30,000 IU/wk) and transfusion therapy. Serum creatinine was 9.8 mg/dL before pregnancy and 7.5 mg/dL during pregnancy. Before and during pregnancy, serum total protein was 6.9 g/dL and 6.6 g/dL and albumin 4.3 g/dL and 3.7 g/dL, respectively. During pregnancy, serum calcium was 8.9 mg/dL, phosphate 4.2 mg/dL, and uric acid 5.4 mg/dL. To quantify hemodialysis treatment adequacy, Kt/V (K: dialyzer clearance of urea, t: dialysis time, V: volume of distribution of urea) is used. Before pregnancy Kt/V was 2.01, but during pregnancy Kt/V was 2.16.

The patient was admitted at 30 weeks gestation for preterm labor and premature rupture of membranes. She underwent emergency cesarean delivery of a live-born female infant weighing 1,250 g and recovered without any further complications. The treatment strategies are summarized in Table 1.

**2. New Born Infant**

At delivery, the neonate did not have any gross abnormalities and weighed 1,250 g. Apgar scores at 1 and 5 minutes were 3 and 5, respectively. The baby was noted to have aspirated meconium and was therefore admitted to the neonatal intensive care unit. Her initial serum creatinine level and total serum bilirubin were 4.5 mg/dL and 3.3 mg/dL, respectively, and normalized after 20 days. Hemoglobin was 19.7 g/dL. Body weight decreased from 1,250 g to 1,110 g on the ninth day of admission, increased to 2,560 g on discharge and increased to 8,000 g after 7 months.

**DISCUSSION**

It had been reported that pregnancy occurs uncommonly in
women with chronic kidney disease because of disorders of ovulation and menstruation, psychological shrinking, decrease in libido, and decreased coitus frequency. Successful pregnancy and delivery have rarely occurred in the patients undergoing hemodialysis [1].

In the pregnant patients with chronic kidney disease who require dialysis, various pregnancy-related complications such as anemia, hypertension, polyhydramnios, preeclampsia, abruptio placentae, disseminated intravascular coagulation, preterm labor, premature rupture of membranes, fetal distress, intrauterine growth restriction, low birth weight, and neonatal death have been described. Among pregnant women undergoing hemodialysis, there have been reports of polyhydramnios, preterm labor, low birth weight neonate, intrauterine growth retardation, and neonatal death caused by uremia. In addition, it is important that diabetic nephropathy patients should be treated by strict glycemic control, blood pressure, and frequency of hemodialysis because of the increase in neonatal death rate due to low birth weight [1,5,6,9].

It is considered that type 1 diabetic patients with nephropathy who are pregnant should use an insulin pump. This patient was well controlled in HbA1c from 9.3% to 6.3% [7]. Because of anemia, we increased IV erythropoietin dose (3,000 IU/wk to >30,000 IU/wk) without complications.

The births in HD patients are preterm with mean gestational age at delivery of 31 to 33 weeks and birth weight at delivery of 1,600 to 2,000 g [10]. But in our case, the baby’s gestational age was 30 weeks and birth weight was 1,250 g and low apgar scores. It is considered to poor blood pressure control during pregnancy before increasing HD session. Most hemodialysis patients have been treated with increasing the frequency of hemodialysis, anemia management, and correction of nutrition status [10].

In summary, we report successful pregnancy and cesarean delivery at 30 weeks in a patient with diabetic kidney disease receiving hemodialysis who had been treated with strict glycemic control and blood pressure control, correction of anemia, and intensive dialysis.

REFERENCES