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Chronic renal failure, diabetes mellitus type-II, and gestation: an overwhelming combination

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Summary

This case report highlights on a child-bearer with chronic renal failure and diabetes mellitus type-II. Chronic renal failure (CRF) with diabetes mellitus (DM) type I in gestation is a rare case of a high-risk pregnancy. What is of significance though in this gestation, is that conception was achieved with the patient treated by a dialysis program. Furthermore, neither hypertension nor intrauterine growth restriction (IUGR) were detected and the patient was normotensive throughout gestation with no clinical signs of anemia. Strict and frequent application of the dialysis programs eradicates the uremic intrauterine environment, reduces the amniotic fluid volume, eliminates the chances of uterine rupture, leads to a longer gestation, increases the newborn's birth weight, and offers an optimal fetal survival rate; this is of note mainly in patients with cesarean sections reported in their medical history. To eliminate the complications of a premature delivery, the present authors had to find the right time point to give birth to this baby taking into account lung maturity, amniotic fluid volume, and preservation of the anatomical uterine integrity.

Key words: Chronic renal failure; Diabetes, hypertension; Fetal growth retardation; Renal dialysis.

Introduction

Chronic renal failure (CRF) is end-stage kidney disease; CRF subjects require the application of frequent dialysis programs in order to survive. CRF is associated with menstrual disturbances, fetal loss, and infertility. Pregnancy superimposed on CRF with diabetes mellitus (DM) type II may prove to have an adverse impact on the mother and increases the incidence of obstetric implications, such as sudden onset of elevated arterial blood pressure, intrauterine growth restriction, premature delivery, and polyhydramnios.

Case Report

The patient, a 32-year-old rhesus positive, non-smoker Greek female, gravid 1, para 2, with a pre-pregnancy weight of 65 kg was diagnosed with end stage renal disease (ERSD) in 2007 during her first pregnancy and she was started hemodialysis in December 2007. The patient conceived, six years after maintenance hemodialysis (three four-hour sessions weekly). Despite the risks of prematurity and neonatal morbidity, the patient opted to continue with the pregnancy. After confirmation of gestation, treatment of dialysis was increased up to four hours daily (six sessions/week). The patient did not develop anemia (Ht=38%, Hb=12.1 gr/dl). Erythropoietin's dose was increased from a mean weekly dose of 9,000 units to 18,000 units during pregnancy. Low-dose aspirin was suggested to prevent preeclampsia.

She visited the outpatient clinic in the present Fetal Medicine Department at 13 weeks of gestation as dated by her last menstrual period. Her nuchal translucency (NT=1.80 mm) was within normal range. She had an important medical history of insulin-dependent diabetes since the age of 13 and one female child delivered at 32 weeks with cesarean section due to deterioration of renal function-weighing 1,530 grams with an uneventful neonatal period. She was on twice-daily short-acting monocomponent insulins injections subcutaneously for her diabetes. Viral serology markers for parvovirus, toxoplasma, cytomegalovirus, and rubella, HIV, HBV, HCV, HSV, and RPR were negative. Clinical examination was normal and no allergies were reported. During her follow-ups, fetal well-being was monitored through serial scanning, assessment of the biophysical profile, and Doppler measurements; *growth pattern was within normal range*. Her second level scan at 22 weeks including cervical length assessment (CL≈3.7mm) showed no anatomical anomalies. Fetal echo revealed no signs of congenital heart disease with a baseline fetal heart rate of 135 beats per minute.

The patient revisited again the clinic for her growth scan at 27 weeks and ultrasound showed polyhydramnios (AFI≈24). Fetal growth (EFBW≈1,030 grams) was calculated by measurement of biparietal (BPD) and occipitofrontal (OCF) diameters, abdominal circumference (AC), and femur length (FL). Admission to the obstetric ward was suggested because of the severely amniotic fluid increase and the consequent premature contractions. During hospitalization, normal blood glucose titer was retained owing to a strict diabetic control; the amniotic fluid index increased up to 26. The patient was on daily hemodialysis; the average concentration of the pre-dialysis and post-dialysis urea were between 80 mg/dl and 45 mg/dl respectively; serum creatinine levels were no more than 5.8 mg/dl and 3.6 mg/dl, respectively. The increased frequency of hemodialysis sessions assisted in achieving normal biochemistry with regards to acid-base and electrolyte balance, avoid marked shifts in intravascular volume, and maintain a friendly metabolic environment for the fetus. The authors were being ex-

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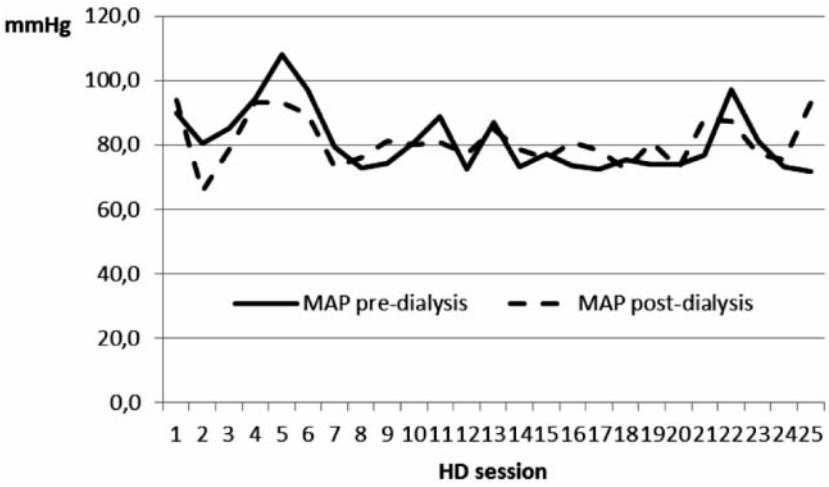

Figure 1. — Pre- and post-dialysis Mean Arterial Pressure (MAP) during the last 25 hemodialysis (HD) sessions.

tremely careful regarding administration of tocolysis due to total failure of the kidneys. She was administered anticoagulant therapy with low-molecular-weight heparin (LMWH) at therapeutic doses throughout renal therapy. Her blood pressure was within normal range (maximum 120/60 mm/Hg) (Figure 1). She developed neither vascular nor neurologic complications in regards to her diabetes mellitus. The marked antenatal surveillance with the use of high resolution ultrasound scanning in combination with daily haemodialysis preserved the normality of the blood volume of the patient and guaranteed a healthy intrauterine environment for the baby's survival. As gestation progressed, biophysical profile was performed weekly and kidney clearance procedures were intensified in order to limit the emergence of polyhydramnios. Doppler assessment of the umbilical and middle cerebral arteries detected no signs of fetal distress.

Taking into account the presence of polyhydramnios, chronic renal failure, and fetal growth curve, a cesarean section was scheduled at 30+3 weeks. Lung maturation was induced with 12 mg betamethasone at 29 weeks (two doses separated in 24 hours). During the cesarean section, complete rupture of the uterine wall was observed. A female baby weighing 1,730 grams was born with Apgar scores of 6 at nine minutes and 7 at five minutes, and the neonate required medical attention; despite considerable efforts in the neonatal ward, the baby of the patient survived ten days. A patent arterial duct, that failed to disintegrate postnatally, contributed significantly to her neonatal death.

Discussion

Gestation is a physiological event that induces kidney function alterations; the stage of renal function is the vital parameter that outlines the course of a gestation and its neonatal outcome. The combination of end-stage renal failure and pregnancy is infrequent. Long-term dialysis therapy is absolutely essential in ESRF; a term used alternatively for chronic renal failure. A considerable number of patients with CRF are asymptomatic, until uremic symptoms appear. The occurrence of a preterm delivery or a baby with fetal growth restriction carries a risk for the appearance of ESRF postpartum. Obstetric management embraces the assessment of renal function, blood pressure, and antenatal monitoring.

Irregular menstrual cycles, anovulation, nausea, and fetal loss appear frequently in dialysis patients. The co-existence of chronic renal impairment and diabetes mellitus in gestation predisposes to a declining renal function and the appearance of obstetric complications: hypertensive crisis, low hematocrit values, polyhydramnios, growth retardation, early uterine contractions, and uremia [1]. Women on chronic dialysis as a result of end-stage renal insufficiency have reduced fecundability; their babies are often born before the 36th week of gestation, and they are of low birth weight; the mean date of delivery in renal patients is approximately 32 weeks. Despite the improved fetal outcome, a large number of pregnancies fail to reach a full-term delivery with the number of neonatal deaths still remaining high [2]. Clinical researchers observed that a long term hemodialysis therapy program applied on polyhydramnios parturients reduced the incidence of uterine rupture and affected positively the fetal survival outcome [1-3]. Intensifying hemodialysis by increasing the number the frequency of treatments reduces amniotic fluid volume; it is considered to be the essential therapeutic means for a favorable fetal outcome. Despite significant improvement on prepregnancy counselling, antenatal surveillance and neonatal care units, infant survival can approach the figure of 50%. Pre-eclampsia and poly- hydramnios require careful attention since they might exert a strong impact on maternal and fetal health. In ESRF, fetal demise can occur early in the second trimester, but the risk of intrauterine death is existent in all three trimesters of gestation; fetal viability is a crucial parameter in renal subjects [4]. Hypertension is indicated as the dominating peril in renal patients. Any type of hypertensive disease (i.e., preeclampsia, chronic hypertension) predisposes to renal damage. Pre-existing kidney disease associated with hypertension renders women susceptible to pre-eclampsia. A common complication in pregnant women

with renal impairment is the incidence of preeclampsia along with a deteriorating kidney function. CRF is responsible for poor placentation and its cognate endothelial dysfunction; obstruction of the glomerular capillaries is the distinguishing feature of kidney damage in pre-eclamptic women. Newborns are subject to growth retardation, preterm delivery, and a higher possibility for hospital admittance. Women of childbearing age, who are on dialysis for chronic renal failure, should be specifically advised prenatally on the possible implications of a preterm delivery with neurodevelopmental delay-a possible consequence of impaired dominant hemispheric maturation- and even worse of a devastating fetal outcome [5]. An analysis of the medical literature illustrates that chronic renal failure is encountered in 0.03% to 0.12% of the parturient cases. Additionally, kidney patients are liable to have comorbidities, i.e., cardiac or lung disease, diabetes or anemia [6]. Regardless of the intensive dialysis programs and the wary prenatal surveillance, a uremic intrauterine environment can be lethal for the growing embryo [7-9]. A constant uterine environment with no abrupt changes in fluid volume and no hypotensive episodes guarantees a favorable prognosis for the neonate. Infant survival is the most challenging part in kidney patients, since the fetus is struggling to grow in a hostile uterine environment; neonatal demise is anticipated more frequently compared to the general population [10]. Given these thoughts, these gestations are deemed to be high risk and childbearers should be counselled by experts on the field to illustrate the utmost hardships and risks throughout the course of gestation. The potential complications of neonatal death and increased maternal morbidity are present, despite the precise application of the obstetric protocols and the efficient management of the polyhydramnios.

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