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Original Article

Pregnancy outcomes after kidney transplantation—A single-center experience in Taiwan

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ABSTRACT

Objective: This study investigated the pregnancy outcomes of women who had undergone kidney transplantations from 1992 to 2013 in a single medical center.
Materials and Methods: Records for patients who had undergone kidney transplantations between 1992 and 2013 at National Taiwan University Hospital, Taipei, Taiwan were retrospectively reviewed, and data on obstetric conditions, neonatal outcomes, and maternal and neonatal complications were collected.
Results: Data for a total of 15 pregnancies in 13 women who had undergone kidney transplantation between 1992 and 2013 were included in this study. The live birth rate was 87%. The mean gestational age was 35.4 ± 3.2 weeks, and the mean birth body weight was 2208.8 ± 678.8 g. Forty percent of the neonates were small for their gestational age (< 10th percentile); 53.3% of the pregnancies resulted in preterm deliveries (< 37 weeks); and 26.7% of the neonates needed Neonatal Intensive Care Unit admission. The prevalence rates of preeclampsia and gestational diabetes were 23.0% and 13.3%, respectively.
Conclusion: The pregnancy outcomes after kidney transplantation were favorable and the mean birth body weight was 2208.8 ± 678.8 g at 35.4 ± 3.2 weeks gestational age. However, the maternal and neonatal complication rates were still high, such as preterm labor, preeclampsia, and small for gestational age.
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Introduction

There are more than 500 kidney transplantations performed in Taiwan each year [1] and Taiwan has the highest rate of end-stage renal disease (ESRD) and dialysis rate in the world [2]. Pregnancy is uncommon in women with ESRD on chronic dialysis [3]. Kidney transplant recipients appear to have a better pregnancy rate and live birth rate. Physiologically, hypothalamic gonadal function [4] and ovulation functions [5] in females with ESRD normalized mostly after kidney transplantation. In a previous study, Gill et al [6] reported that the unadjusted pregnancy rate was 3.3% in the United States during the first three posttransplant years. Various studies on renal allograft recipients have reported successful pregnancy outcomes [7–9]. In a meta-analytical study, Deshpande et al [10] reported the overall post kidney transplantation live birth rate and miscarriage rate to be 73.5% and 14.0%, respectively. However, kidney transplant recipients might have a higher risk of both maternal and neonatal complications, such as preeclampsia, gestational diabetes, preterm labor, and small for gestational age [11].

Premature birth (< 37 weeks) and low birth weight (< 2500 g) were among the most common neonatal complications, affecting nearly half of all newborns. Fortunately, newborn and maternal outcomes seem to remain favorable with successive pregnancies [12]. Improved prepregnancy renal function is also associated with superior graft outcomes [13]. Patients with a prepregnancy creatinine > 150 μmol/L (1.7 mg/dL) are more likely to encounter renal function deterioration and a rise in their baseline creatinine after pregnancy than patients with better prepregnancy renal function [13].

Today, > 15,000 pregnancies have been recorded in > 12,000 kidney transplant recipients worldwide, with a favorable outcome in 65–92% of the cases [14]. However, few studies have been

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published in East Asia, and no data are available for Taiwan, which has the highest rate of ESRD and dialysis in the world. In this report, we describe our experiences in the National Taiwan University Hospital, Taipei, Taiwan and present a retrospective study for the period 1992–2013.

Material and methods

Records for patients who had undergone kidney transplantations at the National Taiwan University Hospital were retrospectively reviewed between January 1, 1992 and December 31, 2013. We used the Electronic Medical Record system at the National Taiwan University Hospital, and patients with International Classification of Diseases codes of "V22: normal pregnancy" and "V42.0 kidney replaced by transplant" were searched between January 1, 1992 and December 31, 2013. Women who became pregnant before kidney transplantation or ongoing dialysis were excluded. Women who had undergone kidney transplantation and who became pregnant without follow-up until delivery were also excluded.

The medical records were reviewed including: maternal age at delivery, parity, duration between transplantation and pregnancy, serum creatinine level, birth body weight, gestational age, the percentile of body weight, and Apgar scores at the 1st minute and 5th minute after birth. Maternal and neonatal complications such as preeclampsia, gestational diabetes, birth complications, small for gestational age (< 10th percentile), and prematurity were also collected. The statistical method was calculation of mean and standard deviation (SD), recorded as mean ± SD.

This study received ethics approval from the Institutional Review Board of National Taiwan University Hospital, (No. 201312107RINA) on January 29, 2014.

Results

Eighteen pregnancies in 16 women who had undergone kidney transplantation between January 1, 1992 and December 31, 2013 were included in this study. All of the pregnancies were conceived naturally. Two of the women decided to terminate their pregnancies. One decision arose from the concern of the use of immunosuppressant as well as economic issues. The other resulted from maternal prior history of hypoxic encephalopathy in the patient, complicated by mental retardation (IQ = 75). In addition, another case was excluded as a result of right tubal ectopic pregnancy. After exclusion, the study comprised 15 pregnancies in 13 women who underwent kidney transplantation in our hospital.

A total of 271 childbearing-age (range, 18–49 years) women had undergone kidney transplantation in our hospital for the period 1992–2013. The fertility rate was approximately 6.6%, without any artificial reproductive technologies. Furthermore, two patients experienced perinatal deaths. The overall rate of successful pregnancies was 5.5% for each childbearing age (range, 18–49 years) woman after kidney transplantation.

The maternal background data is summarized in Table 1. The mean age of the patients at the time of delivery was 33.8 ± 5 years (range, 21–41 years). The mean age at the time of transplantation was 28.5 ± 4.5 years (range, 16–36 years). Immunosuppressant therapy comprised cyclosporine and prednisolone in eight patients, mycophenolate mofetil, sirolimus and prednisolone in one patient, cyclosporine and mycophenolate mofetil in one patient, tacrolimus, sirolimus, and prednisolone in one patient, tacrolimus and prednisolone in two patients, and tacrolimus in two patients.

Tables 2 and 3 summarizes the pregnancy outcomes. The mean gestational age was 35.4 ± 3 weeks (range, 26.1–38.3 weeks). The mean birth body weight was 2208.8 ± 678.8 g (range, 524–3308 g). Forty percent of the neonates were born small for their gestational ages (< 10th percentile). Preterm deliveries comprised 53.3% (20.0%, < 34 weeks and 33.3%, 34–37 weeks), and 26.7% of the neonates needed NICU admission. Sixty percent of the neonates were born via cesarean sections and the remaining six women underwent vaginal deliveries.

Table 4 summarizes the maternal complications and graft outcomes. The mean serum creatinine level prior to pregnancy was 1.15 ± 0.3 mg/dL (range, 0.7–2.5 mg/dL). The prevalence rate of preeclampsia of pregnancy was 26.7% (n = 4). The maternal gestational diabetic rate was 13.3% (n = 2). None of the patients died during pregnancy or delivery. The graft survival rates at 1-, 5-, and 10-years after delivery were 100%, 100%, and 92.3%, respectively. Only one woman experienced graft failure at 7 years post-delivery. In Case 2, graft failure was noted 7 years later, which resulted from chronic rejection proved by kidney biopsy.

Several unfavorable cases were noted in our study, including two perinatal mortalities and one neonatal morbidity. In Case 3-1, the patient received an emergent cesarean section due to previous cesarean section and fetal distress at gestational age (GA) 35 + 4 weeks. The initial Apgar score was 0->0->3 and the birth body weight was 1698 g. Intubation was performed, but the neonate nevertheless expired due to respiratory failure on the same

Table 1
Maternal transplantation related data.

Patient	Underlying disease	Type of dialysis	Age at Transplantation	Immunosuppressant	Duration from transplantation to pregnancy
1	RPGN	HD	28	CyA + Pred	3 y 2 mo
2	CGN	HD	30	CyA + Pred	1 y 3 mo
3-1	CGN	HD	33	CyA + Pred	3 y 10 mo
3-2				CyA + Pred	6 y 5 mo
4-1	SLE	HD	30	CyA + Pred	1 y 11 mo
4-2				CyA + Pred	3 y 7 mo
5	CGN	HD	23	MMF + Sir + Pred	2 y 5 mo
6	CGN	HD	16	CyA + MMF	4 y 8 mo
7	CGN	PD	21	CyA + Pred	11 y 4 mo
8	SLE	HD	30	Tac + Sir + Pred	2 y 3 mo
9	CGN	PD	36	CyA + Pred	3 y 10 mo
10	CGN	HD	30	Tac + Pred	1 y 11 mo
11	IgA nephropathy	HD	30	Tac	9 y 1 mo
12	CGN	HD	30	Tac	4 y 7 mo
13	CGN	HD	26	Tac + Pred	11 y 1 mo
Mean		HD:PD = 11:2	28.5 ± 4.8		4 y 6 mo

CGN = chronic glomerulonephritis; CyA = cyclosporine; HD = hemodialysis; MMF = mycophenolate mofetil; PD = peritoneal dialysis; Pred = prednisolone; RPGN = rapidly progressive glomerulonephritis; Sir = sirolimus; SLE = systemic lupus erythematosus; Tac = tacrolimus.

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