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Case Report

The effect of spontaneous twin pregnancy on renal transplant function and haemodynamics

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Abstract

Spontaneous twin pregnancy is rare in renal transplant recipients, and confers a significant risk, in terms of both transplant dysfunction and fetal complications. Physiological changes in renal haemodynamics may assist in predicting a favourable outcome, but have not been previously reported in these circumstances. We present a case of a successful outcome for both mother and babies, and detail the effects of the pregnancy on transplant function and haemodynamics within the transplant kidney. Without beneficial circumstances, twin pregnancy may be a high risk in renal transplant recipients and may lead to a poor outcome for both transplant and fetuses.

Keywords: haemodynamics; pregnancy; renal transplantation; twins

Introduction

Pregnancy after renal transplantation is associated with an increased risk for both mother and fetus. Higher rates of stillbirth, preterm delivery, low birth weight, pre-eclampsia, neonatal death and transplant dysfunction are reported [1]. Spontaneous twin pregnancy is uncommon in renal transplant recipients and potentially presents an even greater risk to the mother, the transplant and the fetuses [2,3].

We present a case of a successful outcome for both mother and babies and describe the effects of the pregnancy on transplant function and haemodynamics within the transplant kidney.

Case report

A 27-year-old woman received a deceased donor kidney transplant in December 1995 from a 10-year-old donor, human leucocyte antigen 3/6 mismatch (A, B and DR 111). She had a past history of recurrent urinary infections and hypertension and presented initially to the nephrologists with bilateral dysplastic kidneys requiring peritoneal dialysis prior to transplantation. Immunosuppression at induction was cyclosporin 200 mg BD, azathioprine 75 mg daily and prednisone 20 mg daily. At the time of spontaneous conception (March 2007), she was taking cyclosporin 100 mg BD, azathioprine 50 mg daily and prednisolone 5 mg daily, with no other medications or anti-hypertensive agents.

The course of the diamniotic dichorionic pregnancy was largely uneventful apart from a modest increase in proteinuria and blood pressure (BP). Proteinuria (0.3 g/24 h) increased to 0.5 g/24 h by 28-week and 1 g/24 h by 30-week gestation. Blood pressure increased significantly after 31 weeks, just before delivery (Figure 1a). At 31 weeks, corticosteroid therapy was introduced to enhance fetal lung maturity, in anticipation of preterm delivery. Nifedipine 30 mg daily was commenced as BP was 146/87 mmHg. Cardiotocograph of both fetuses demonstrated heart rates of 140 and 135 beats per minute, respectively, with good variability, presence of accelerations and no significant decelerations.

At 32 weeks, a 'semi-elective' caesarean section was performed, due to BP increasing to 155/98 mmHg despite nifedipine therapy and increased proteinuria (not quantified but dipstick positivity increased). Two healthy babies were delivered weighing 1.96 and 1.86 kg, respectively. Delivery required a minimal medical input initially, with both fetuses having normal Apgar scores of 9 and 10 at 1 min and 5 min, respectively.

Both babies spent 26 days in the special care baby unit. Both suffered respiratory distress syndrome (oxygen saturations of 92% on room air, and tachypnoea with an initial respiratory rate of 60–70 breaths per minute), requiring oxygenation with non-invasive continuous positive airway pressure ventilation. At the time of discharge from hospital their weights were 2.3 and 2.22 kg, and by 5 months post-delivery 7.91 kg (50–75th percentile) and 8.73 kg (91st percentile), respectively.

During the pregnancy, serum creatinine fell by 39% (142–91 μmol/L), urea by 39% (9.0–5.5 mmol/L) and albumin by 29% (39–28 g/L), (Figure 1b). Uric acid levels increased late in pregnancy from 0.39 mmol/L to 0.48 mmol/L at 31 weeks and 0.55 mmol/L just before delivery.

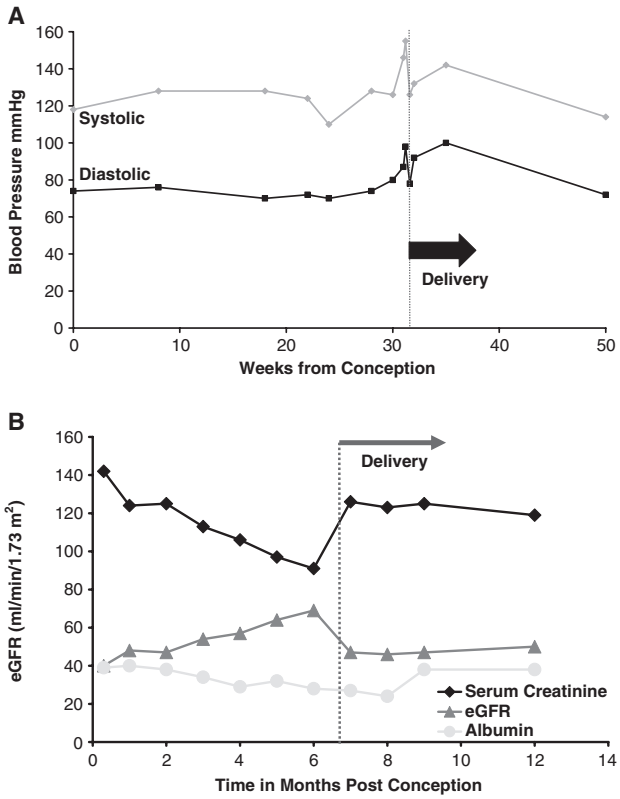

Fig. 1. (**A**) Changes in systolic and diastolic blood pressure throughout pregnancy. Rise in blood pressure in the week before semi-elective delivery was performed. Oral nifedipine was commenced at this point. (**B**) Biochemical changes (serum creatinine, serum albumin and eGFR) during twin pregnancy.

Cyclosporin trough levels, despite the changes exhibited in metabolic activity and volume distribution during the pregnancy, remained stable from preconception levels of 36–30 ng/ mL pre-delivery and 48 ng/mL 2 weeks post-delivery. There was no change in dosage throughout pregnancy.

Serial transplant ultrasound scans by a single operator revealed a 21% increase in the cross-sectional area of the kidney (Figure 2a) with a 10% increase in main renal artery peak flow and a 21% reduction in the resistive index (RI) (Figure 2b can be seen online in colour as supplementary information). Following pregnancy, the creatinine increased to 129 μmol/L, urea 8.1 mmol/L and albumin 38 g/L, and these remained stable. The RI remained unaltered, main renal artery peak flow fell by 50%, while the kidney cross-sectional area returned to baseline post-delivery. Currently, more than 2 years post-partum, mother and babies are healthy and transplant function stable.

Discussion

This report describes a successful twin pregnancy in a renal transplant recipient. Exceptional graft conditions may have facilitated this success. Our patient was young, had excellent allograft function 12 years post-transplantation from a young donor and had minimal pre-conception proteinuria and normal BP with no other comorbidities. She, therefore, fulfilled recommendations related to a safe potential outcome [4].

Pregnancy rates in patients with moderate-to-severe chronic kidney disease (CKD) are significantly reduced compared to the general population, due to the effects of CKD on gonadal function. Renal transplantation often restores fertility via improvements in the hypothalamic–pituitary axis, which leads to a restoration of the ovulatory cycle in women and improved sperm motility in men. According to registry data, pregnancy has become increasingly common in renal transplant recipients [5,6]. However, spontaneous twin pregnancy remains uncommon.

The degree of pre-existing renal impairment correlates with the risk of poor pregnancy outcome, including pre-eclampsia, preterm birth, small for gestational age and neonatal mortality [1,7]. Recent guidelines suggest that it is safe to proceed with pregnancy as early as 6 months following transplantation if graft function is optimal (creatinine <132 mmol/L), urinary protein excretion is minimal (<500 mg/24 h) and immunosuppression dosing is stable [4].

Changes in renal haemodynamics during pregnancy are thought to be similar in renal transplant recipients compared to non-transplant patients, with up to a 70% rise in renal blood flow (RBF), 50% increase in glomerular filtration rate (GFR) and 50% fall in urea and creatinine [8]. However, physiological adaptations seen in normal pregnancy may not occur in patients with CKD or renal transplantation, especially if the creatinine is >200 μmol/L, leading to a potential blunted rise in GFR [9]. In our twin pregnancy case, we demonstrated a 40% fall in creatinine with a concomitant 10% increase in the velocity of RBF. Unfortunately, there is no clinically reliable method to measure RBF. The arteriolar tone affects renal plasma flow (RPF). Normally, resistance to flow across the arterioles constitutes most (∼85%) of the renal vascular resistance (the remaining from the peri-tubular capillaries and renal veins). As RPF is inversely related to renal vascular resistance, one can conclude that in our case there was an increase RBF of ∼18%. Most of this increase in renal perfusion could be accounted for by the volume expansion and hence lead to the increased GFR. Monitoring of haemodynamic changes may help to predict a successful outcome.

Summary

This case highlights the physiological adaptations in the transplant of a successful twin pregnancy. It should be acknowledged that given beneficial circumstances, there may be no increased risk in comparison to non-transplant females. Without these, pregnancy may be high risk leading to poor transplant and fetal outcomes. Physiological parameters may prove useful in predicting a successful outcome in prospective studies.

Conflict of interest statement. We confirm that neither the manuscript nor any significant part of it has appeared elsewhere in a manner that could be construed as a prior or duplicate publication of the same, or very similar, work. All named authors have contributed according to ICMJE guidelines to the study. S.B. has previously been on the advisory board

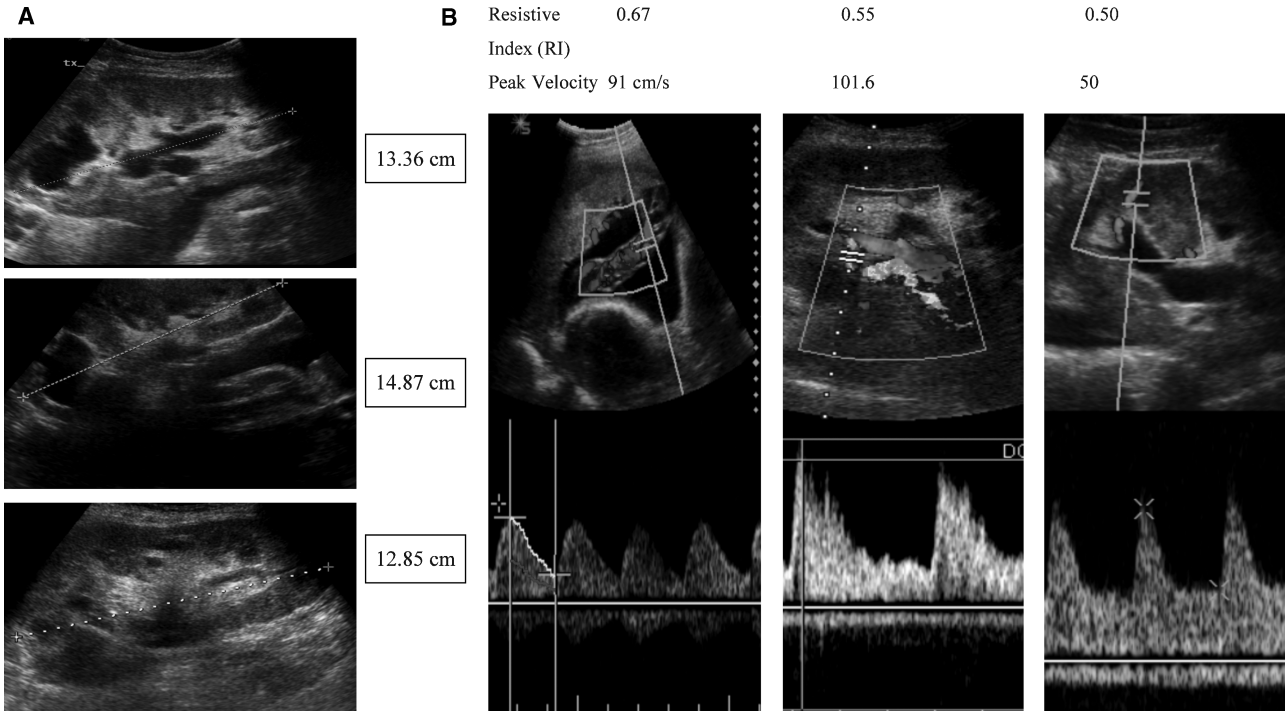

Fig. 2. (**A**) Images of changes in transplant size during pregnancy. (**B**) Change in transplant blood flow. (Figure 2b can also be seen online in colour as supplementary information online.)

for Roche and Astellas and has received honorarium for lectures and funds for assistance in travel to medical conferences from a number of pharmaceutical companies, including Pfizer, Roche, Novartis and Amgen.

Supplementary data

Supplementary data is available online at http://ndtplus.oxfordjournals.org.

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