Peritoneal dialysis throughout pregnancy with successful outcome: A case report

GL Malin¹, SVF Wallace¹, M Hall² and A Ferraro²

Abstract

We present the case of a 28-year-old woman who was para 1, with end-stage renal failure secondary to reflux nephritis. She conceived after two years on peritoneal dialysis. She successfully continued this throughout pregnancy, although her antenatal course was complicated by an episode of peritonitis. Induction at 34 weeks resulted in a vaginal birth of a live boy. Her postnatal course was uncomplicated. We reviewed the literature regarding peritoneal dialysis in pregnancy. A recent systematic review identified 14 cases. When the outcomes of these women were compared with those receiving haemodialysis in pregnancy, there was a significantly higher proportion of small for gestational age fetuses, but other parameters were comparable. Two cases of peritonitis complicating peritoneal dialysis in pregnancy have been reported, both successfully treated. We conclude that peritoneal dialysis may be continued in pregnancy with successful maternal and fetal outcome, particularly in women with some residual renal function.

Keywords

Maternal–fetal medicine, nephrology, high-risk pregnancy

Date received: 24 April 2017; accepted: 7 September 2017

Introduction

We present a case of a 28-year-old woman with end-stage renal failure, who conceived whilst on peritoneal dialysis (PD). She continued this therapy throughout her pregnancy with a successful outcome. Pregnancy in women on dialysis is rare, and the majority of published data relate to haemodialysis (HD). We describe our management and a review of the existing literature regarding PD in pregnancy.

Case report

This report describes a woman with chronic kidney disease (CKD) secondary to reflux nephropathy, who had been under the care of the renal physicians in our tertiary centre for many years. Previously, during work up for dialysis, and despite established amenorrhoea attributed to advanced CKD, she had a positive result for pregnancy test. On that occasion, an ultrasound scan confirmed a viable fetus of 19 weeks' gestation. Serum creatinine (Cr) level at this time was 299 µmol/L. She had significant proteinuria (protein:creatinine ratio (PCR) 233 mg/mmol creatinine). Her renal function deteriorated as pregnancy progressed, and labour was induced at 34 weeks' gestation, at which time her creatinine level was 346 µmol/L. She had a normal vaginal birth of a live baby weighing 1.69 kg. Six weeks later, her estimated glomerular filtration rate (eGFR) was 8 ml/min/1.73 m² and Cr 548 µmol/L. She commenced PD and was added to the renal transplant waiting list.

Two years later, whilst on PD, she became anaemic and developed an abdominal mass, initially thought to be a palpable bladder. Ultrasound scan revealed a pregnancy of 20 weeks' gestation, and she was referred urgently to our joint renal-obstetric clinic. She received counselling on treatment options, including HD, and the reported outcome data of pregnancies conceived on dialysis. She elected to continue with the pregnancy and remain on PD. She was commenced on enoxaparin for venous thromboembolism prophylaxis due to persisting, significant, proteinuria. She also continued on folic acid, calcium acetate, darbepoetin and alfacalcidol. The schedule of monitoring and investigations are given in Table 1.

She had commenced pregnancy with significant residual renal function – a weekly creatinine clearance (CrCl) of 68.4 L, equivalent to 6.8 ml/min, and this increased during pregnancy to 85.9 L/week (8.5 ml/min) at 27 weeks' gestation. Dialysis prescription was adapted

to target maternal serum urea <15 mmol/L, based on observational data extrapolated from HD recipients.¹ Her automated PD regime comprised an 8-h overnight cycle with four 1.5-L exchanges of 1.36% glucose solutions. A fifth exchange was introduced at 24 weeks' gestation, extending her overnight treatment to 12 h.

At 24 weeks' gestation, she developed abdominal pain and cloudy PD effluent. Peritonitis was confirmed on effluent microscopy. Coagulase-negative staphylococci were cultured, and she was successfully treated with a 2-week course of intraperitoneal vancomycin.

Her darbepoetin dose was increased from 25 µg/week to 50 µg/week during the third trimester due to falling haemoglobin levels (Figure 1). Her blood pressure remained stable throughout pregnancy. Her baseline blood pressure was 132/75 mmHg and at 34 weeks was 103/62 mmHg. The urinary PCR was also stable: 191 mg/mmol Cr at the time pregnancy was diagnosed, and 194 mg/mmol Cr at 34 weeks. There was a decline in the serum albumin level throughout gestation, from a baseline pre-pregnancy level of 36 g/L to 22 g/L at 34 weeks. Her residual CrCl increased through the pregnancy. At 16 weeks, her dialysis CrCl was 27.1 L/week, and residual CrCl was 77.0 L/week (total 104.1 L/week). At 27 weeks, the dialysis CrCl was 28.3 L/week, and residual CrCl was 85.9 L/week (total 114.2 L/week).

Fetal growth was linear throughout, with abdominal circumference on the 50th centile and estimated fetal weight between the 25th and 50th centiles, although persistent polyhydramnios was noted.

The potential risks and benefits to prolonging pregnancy were considered. There is a paucity of data to guide timing of birth. The risks of continuing the pregnancy were felt to include the potential to develop pre-eclampsia, deterioration in renal function, and stillbirth. In view of persistent polyhydramnios, erythropoietin hyporesponsiveness, and satisfactory fetal growth, these risks were felt to outweigh those of prematurity. The decision was made following discussion between

¹Department of Obstetrics and Gynaecology, Nottingham University Hospitals NHS Trust, Nottingham, UK

²Nottingham Renal and Transplant Unit, Nottingham University Hospitals NHS Trust, Nottingham, UK

Corresponding author:

GL Malin, Maternity Department, Nottingham City Hospital, Hucknall Road, Nottingham NG5 1PB, UK.

Email: gemmamalin@doctors.org.uk

Table 1. Schedule of appointments and investigations during pregnancy for our pregnant woman on peritoneal dialysis.

	Frequency
Appointments	
Renal-obstetric clinic	Fortnightly
Peritoneal dialysis team review	Weekly
Obstetric anaesthetist	One-off
Investigations	
Blood pressure and urinalysis	Weekly
Full blood count (FBC)	Weekly
Urea and electrolytes (U&E)	Weekly
Factor Xa assay ^a	Fortnightly
Serum bicarbonate	Fortnightly
Urine protein:creatinine ratio (PCR)	Fortnightly
Ultrasound scan for fetal biometry and liquor volume	Fortnightly
Serum ferritin	Monthly
Transferrin saturation (TSAT)	Monthly
Serum calcium and phosphate	Monthly
Midstream urine sample for microscopy and culture ^b	Monthly
Peritoneal dialysis adequacy test (Kt/V)	Monthly

^aHeparin prophylaxis was indicated in this case due to significant proteinuria.

^bIndicated for women at increased risk of urinary tract infection in pregnancy (in this case due to structural damage).

the obstetric and renal team, and the pregnant woman, to induce labour at 34⁺5 weeks after a course of intramuscular steroids for fetal lung maturation.

The woman had a normal vaginal birth of a 1.96-kg baby boy (9th–25th centile). The birth weight was lower than that estimated on the final growth scan at 34 weeks (2.34 kg, within 20% of estimated). She continued PD in the obstetric unit in the peripartum period. Her postnatal course was uneventful. Following delivery, her son was admitted to the neonatal unit for 48 h of observation but did not need invasive intervention. There was no evidence of neonatal hypoglycaemia, and the first blood glucose following birth was 5.2 mmol/L. Her son has no identified complications of prematurity.

She went on to have a successful renal transplant a year later.

Discussion

Pregnancies in women on dialysis are rare, and outcomes have historically been poor. However, recent data have suggested that, in pregnant women already established on HD, an intensified dialysis regimen is associated with an increase in successful pregnancy outcomes. Live birth rates were 85% in women dialysed >36 h/week compared to 48% in those dialysed ≤20 h/week.¹

The use of PD in pregnancy is rare with less than 100 published cases. There are practical reasons why PD adequacy might decline during pregnancy – reduced available peritoneal membrane surface area, an inability to accommodate adequate volumes of peritoneal dialysate or the migration of the dialysis catheter. Consequently, elective transition to HD in early pregnancy may be considered, to enable the evidence-based regimens described above which are associated with

Figure 1. Change in haemoglobin level (g/L) and darbepoietin dose (µg/week) for our pregnant woman on peritoneal dialysis from last menstrual period to delivery.

the best reported outcomes. However, establishing HD vascular access is not without risk and the intensified schedule can be prohibitively inconvenient.

A systematic review of dialysis schedules and pregnancy outcomes identified 14 cases of PD being used in pregnancy.² No infant deaths were recorded, but a significantly higher rate of babies small for gestational age (SGA) were identified in the PD group when compared to women on HD (67% vs. 31%, $p=0.015$). It is plausible that the reported differences in SGA rate in observational cohort studies reflect a difference in deliverable solute clearance between modalities and/or differences in patient characteristics. In our case report, the infant was born without growth restriction. This might represent an effect of the high solute clearance achieved through dialysis plus residual renal function (114.2 L/week (11.3 mL/min) at peak), or a reflection of the patient's normal blood pressure and sub-nephrotic proteinuria. During PD, a proportion of glucose within the instilled fluid is absorbed, leading to a rapid increase in serum glucose level (1.3 ± 1.2 mmol/L in non-diabetic patients) and insulin response approximately 30 min after fluid instillation.³ There is no published evidence to support these modest excursions in serum glucose and insulin adversely affecting fetal growth in women receiving PD. Nor is there evidence of PD fluid or catheters having a pressure or mechanical effect on uterine growth during pregnancy.

Although in our case the actual birth weight (10th–25th centile) was less than predicted (50th centile), the absolute discrepancy was less than 20% and there was no definite evidence of growth restriction. The limitation of ultrasound in estimating fetal weight is well documented.⁴

Other outcomes in the systemic review, including prematurity, did not show a significant difference. Polyhydramnios was reported in 2 of 14 cases – attributable to fetal osmotic diuresis as a result of fetal exposure to maternal uraemic serum. Due to small numbers, it was not possible to compare the differences in outcome between the PD regimes used. Peritonitis was not a reported outcome in the systematic review; however, we have identified two previously published cases of PD peritonitis in pregnancy.^{5,6} Both were successfully treated, without fetal compromise.

There are inadequate data to determine a generalisable strategy to optimise outcomes for pregnant women receiving dialysis, and decisions should be individualised following adequate counselling. In the case presented here, the patient's significant residual renal function is likely to have contributed to the relatively uncomplicated pregnancy and ability to maintain biochemical stability with PD. Women who are anuric or have minimal residual renal function are more likely to develop concerns regarding fluid status and accumulation of uraemic metabolites during pregnancy, particularly if clinicians aim for biochemical targets such as serum urea <15 mmol/L. In these cases, elective transfer to HD should be considered.

We conclude that PD may be continued during pregnancy for some women with successful maternal and fetal outcome. Intensive monitoring and a multidisciplinary approach are essential.

Acknowledgements

We thank the woman to whom this case report refers for giving consent for publication.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Ethical approval

Written consent for publication was obtained from the individual concerned. No ethical approval was required.

Guarantor

GLM

Contributorship

GLM drafted the article. SVFW conceived the case report; SVFW, MH and AF critically revised the article and all authors approved the final version for publication.

References

1. Hladunewich MA, Hou S, Odutayo A, et al. Intensive hemodialysis associates with improved pregnancy outcomes: a Canadian and United States cohort comparison. *J Am Soc Nephrol* 2014; 25: 1103–1109.
2. Piccoli GB, Minelli F, Versino E, et al. Pregnancy in dialysis patients in the new millennium: a systematic review and meta-regression analysis correlating dialysis schedules and pregnancy outcomes. *Nephrol Dial Transplant* 2016; 31: 1915–1934.
3. Oba I, Mori T, Chida M, et al. Glucose and insulin response to peritoneal dialysis fluid in diabetic and nondiabetic peritoneal dialysis patients. *Adv Perit Dial* 2015; 31: 11–16.
4. Burd I, Srinivas S, Paré E, et al. Is sonographic assessment of fetal weight influenced by formula selection? *J Ultrasound Med* 2009; 28: 1019–1024.
5. Jefferys A, Wyburn K, Chow J, et al. Peritoneal dialysis in pregnancy: a case series. *Nephrology (Carlton)* 2008; 13: 380–383.
6. Tuncer M, Trak B, Sapan M, et al. Successful pregnancy complicated with peritonitis in a 25-year-old Turkish CAPD patient. *Perit Dial Int* 2000; 20: 349–350.