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Posterior urethral valves: Impact of low birth weight and preterm delivery on the final renal outcome

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KEYWORDS

Chronic kidney disease;
Low birth weight;
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Prognosis

ABBREVIATIONS

(L)(N)BW, (low) (normal) birth weight;
CKD, chronic kidney disease;
NICU, Neonatal Intensive Care Unit;
PUVs, posterior urethral valves;
US, ultrasonography;

Abstract ***Objective:*** To investigate the relationship between low birth weight (LBW; <2.5 kg) and preterm delivery (<37 weeks gestational age) and final renal outcome in infants with posterior urethral valves (PUVs), emphasising the risk factors for the development of chronic kidney disease (CKD).

Patients and methods: A retrospective review was performed for all infants with PUVs who were treated between 1990 and 2010. In all, 52 infants were identified to have LBW and/or delivered preterm (Group 1). Infants in Group 1 were compared with a matching group (Group 2) of 60 full-term normal birth weight (NBW) infants with PUVs managed during the same period. The outcome of both groups was analysed.

Results: During follow-up, CKD developed in 17 (32.5%) and 22 patients (36.5%) in Groups 1 and 2, respectively ($P = 0.812$). Patients with LBW or delivered preterm had significantly higher incidence of oligohydramnios ($P = 0.009$), increased risk of vesicostomy ($P < 0.001$), longer hospital stay ($P < 0.001$), and higher incidence of vesico-ureteric reflux (VUR, $P = 0.024$). In the LBW patients, initial serum creatinine, nadir serum creatinine, oligohydramnios and Neonatal Intensive Care Unit (NICU) length of stay were significant predictors of final renal outcome ($P < 0.001$, $P = 0.002$, $P = 0.004$ and $P = 0.012$, respectively).

Conclusion: In our cohort of LBW and preterm delivery infants with PUVs, outcomes were similar to those of NBW full-term infants with PUVs but with an

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VCUG, voiding cystourethrography

increased risk of vesicostomy, longer hospital stay, and higher incidence of VUR. LBW was associated with oligohydramnios, longer NICU admission, high initial and nadir serum creatinine, which were associated with a poor prognosis.

Introduction

Posterior urethral valves (PUVs) are the most common cause of congenital lower urinary tract obstruction in male infants, leading to varying degrees of renal and bladder dysfunctions [1–5]. Due to advances in antenatal screening, almost all cases are now detected antenatally [5,6]. During pregnancy, foetal problems can occur due to PUVs, such as oligohydramnios, pulmonary hypoplasia, renal dysplasia, intrauterine growth retardation, and preterm delivery. If early prenatal detection of PUVs is documented, some centres offer termination of pregnancy, especially if the kidneys are severely affected; however, this is not the common scenario [5,6].

Foetal intervention was introduced to alleviate urethral obstruction prenatally aiming to prevent postnatal renal and bladder damage; however, the results have been frustrating [7,8]. Lung immaturity is a major problem in low birth weight (LBW) infants with PUVs and associated oligohydramnios, which usually require prolonged mechanical ventilation and admission to the Neonatal Intensive Care Unit (NICU). Over the last two decades there have been significant improvements in the medical care for preterm and LBW infants that have led to a decrease in the mortality rate.

Preterm delivery for patients with PUVs is not uncommon and dealing with this subset of patients is quite challenging [9]. Initial vesicostomy is the preferred mode of management in preterm or LBW infants due to the unavailability of appropriate instruments and/or a small calibre urethra. However, with the advent of neonatal scopes, neonatal PUV ablation can be done for these infants at an early age.

The purpose of the present study was to determine the incidence of chronic kidney disease (CKD) and the factors that can determine this outcome in infants who underwent PUV management and were confirmed to have a preterm delivery or LBW. The hypothesis was that LBW and preterm infants may have postnatal impaired nephrogenesis that could predispose to renal dysfunction later in life and adding a major pathology such as PUVs may result in worse renal outcomes.

Patients and methods

Between 1990 and 2010, 315 infants with PUVs were diagnosed and treated at two tertiary centres. After obtaining Institutional Review Board approval, a retrospective review was performed of all infants who were diagnosed with PUVs born with a birth weight (BW) of <2.5 kg or at <37 weeks of gestation (Group 1). Another group of infants were treated during the same period of the study who were full term and had a normal BW (NBW) and comprised the control group for comparison (Group 2). The outcome of both groups was analysed with the focus on antenatal ultrasonography (US) results, BW, gestational age, associated oligohydramnios, associated respiratory distress, admission to the NICU, age and mode of management, postoperative complications, and long-term renal outcome.

In Group 1 patients, induction of delivery was necessary in 23 (44%) due to either oligohydramnios with bilateral significant hydronephrosis or intrauterine growth retardation. In all, 20 patients were born by Caesarean section and 32 were born vaginally. All patients in Group 1 were admitted into the NICU for varying periods for respiratory support, fluid and electrolyte balance, and nutrition. Bladder decompression by transurethral or suprapubic catheters was necessary in all the patients until surgical intervention. Serum electrolytes, blood urea nitrogen and creatinine levels were measured as markers for renal function in all patients at presentation and at time of PUV ablation. Renal US and voiding cystourethrography (VCUG) were carried out in all patients to confirm the diagnosis and as a baseline for future follow-up.

Surgical intervention was primary PUV ablation in most of the patients (82%), while cutaneous vesicostomy was indicated in those for whom PUV ablation could not be performed due to a small calibre urethra or unavailability of suitable instruments. The mean age at surgery was 26 and 22 days for Groups 1 and 2, respectively. PUV ablation was done, regardless of the infant's weight, according to the urethral calibre using 7.5, 8.5 or 10 F cystoscopes with a cold knife to avulse the PUV leaflets at the 5, 7, and 12 o'clock positions. Vesicostomy was performed using the Blocksom technique in 18 of the 52 patients in Group 1 and in two of 60 patients in Group 2. All procedures were done under general anaesthesia.

The patients were followed-up every 3–6 months and were evaluated clinically by physical examination and blood pressure measurement and radiologically by renal and bladder US. A VCUG was ordered once to ensure adequate PUV ablation and repeated if necessary. In addition, urine analysis, urine culture and serum crea-