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Neonatal hydronephrosis detected on routine health check-up

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Background/purpose
Prenatal dilatation of the urinary tract may be caused by obstructive defects, and it is known that 20% of normal fetuses have some degree of renal pelvic or calyceal dilatation, determined by sonographic examination.
We analyzed the clinical course of patients found to have dilatation of the renal pelvis by ultrasound 1 month after birth, and compared prenatal and postnatal sonograms of each patient.

Methods: Between January 1996 and December 1998, renal ultrasounds were performed on 2,071 children at their 1 month routine health checks in our hospital. We found dilatation of the renal pelvis in 92 kidneys in 84 children and then compared these neonatal sonograms with the prenatal ultrasounds for each child. Ultrasound examinations were performed at 28 weeks of gestational age and 1 month after birth. Our criterion for diagnosis of hydronephrosis at 1 month of age was a renal pelvis measuring greater than 7 mm at the central echo complex. The medical records of patients found to have hydronephrosis were then reviewed.

Results: Eight patients had bilateral hydronephrosis, 2 had dilatation only in the right kidney and 74 had this finding only in the left kidney. Examination of 36 (39%) of these 92 kidneys revealed renal pelvic dilatation to be present both prenatally and neonatally. The dilatation ranged from 7 to 43 mm. No dilatation of the renal pelvis was seen on the other 56 fetal examinations. During the follow-up period, 2 patients (1 with bilateral and the other with right-sided hydronephrosis) were diagnosed with vesicoureteral reflux, the 1 patient with bilateral pelvic dilatation was found to have a vesico-ureteral junction obstruction. After full evaluation, the other children were found to have no anatomic abnormalities.

Conclusions: We found 84 of 2,071 children showed dilatation of the renal pelvis on ultrasound examination performed at 1 month of age. Three (3.3%) of the 84 children required surgery to correct the neonatal hydronephrosis detected via this imaging modality. Interestingly, 88% of the children had only left-sided hydronephrosis, which did not predict an adverse outcome during the follow-up period.
We conclude that neonatal hydronephrosis appears to be a relatively benign condition and the requirement of surgery is relatively slight.

Key words : Neonatal hydronephrosis, Pre and postnatal sonograms

INTRODUCTION

With fetal urologic abnormalities being increasingly recognized, the purpose of making prenatal diagnoses has progressed from simple detection to appropriate management. Prenatal dilatation of urinary tract structures may be due to obstructive or nonobstructive causes, and it is known that 20% of normal fetuses show some degree of renal pelvic dilatation on sonographic examination. The aim of this study was to analyze the clinical course of patients who had hydronephrosis at their 1-month health check, and to study retrospectively their prenatal sonograms.

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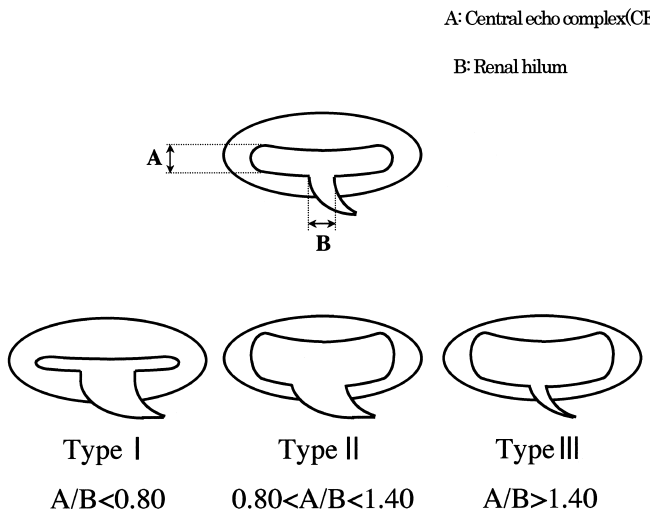

Fig. 1 Measurement of the dimensions of the renal hilum and central echo complex of the kidney

Table 1 Results of perinatal ultrasonographic examination

	Kidneys	
	No. Pos/No. exam (%)	
	Group 1	Group 2
Type I	21/36 (58%)	28/56 (50%)
Type II	11/36 (31%)	11/56 (20%)
Type III	4/36 (11%)	14/56 (25%)
Others	0	3/56 (5%)
Total	36/92 (39.1%)	56/92 (60.8%)

Type I: Central echo complex (CEC)/renal hilum (RH) is less than 0.80
Type II: CEC/RH ranges from 0.80 to 1.40
Type III: CEC/RH is greater than 1.40

PATIENTS AND METHODS

Between January 1996 and December 1998, 2,071 children received renal ultrasound at their 1-month health check at Tokai University Hospital. We found dilatation of the renal pelvis of 92 kidneys in 85 children (58 boys and 27 girls), and then compared these sonograms with the prenatal sonograms. The criterion for fetal hydronephrosis was a renal pelvis greater than 7 mm in diameter at the renal hilum or central echo complex (CEC) of the kidney. According to the prenatal medical records, the gestational age at the initial sonogram and detection of hydronephrosis was 28 weeks. A diagnosis was made at 1-month of age children if the pelvis was greater than 7mm in diameter at the CEC. The children were divided into two groups: those in Group 1 had CEC dilatation on fetal sonography, and Group 2 did not have fetal CEC dilatation. Furthermore, each group was sub-divided into 3 types based on sonographic findings: Type I, dilatation at the renal hilum; Type II, dilatation at the renal hilum and CEC; and Type III, only CEC dilatation (Fig 1).

RESULTS

Bilateral pelvic dilatation was found to in 8 patients, right-sided in 2, and left-sided in 74. Serial assessment of 92 kidneys with hydronephrosis revealed renal pelvic dilatation during both the prenatal and neonatal

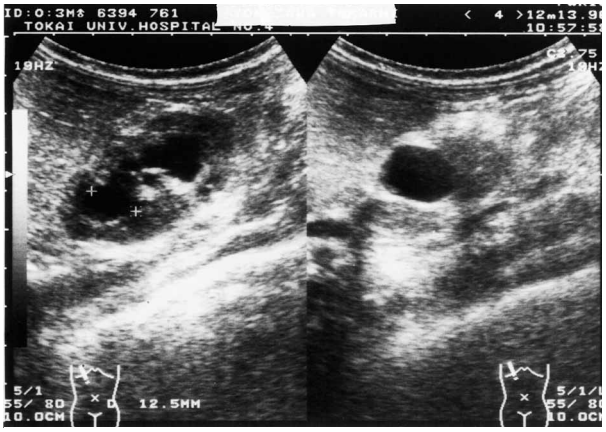

Fig. 2A

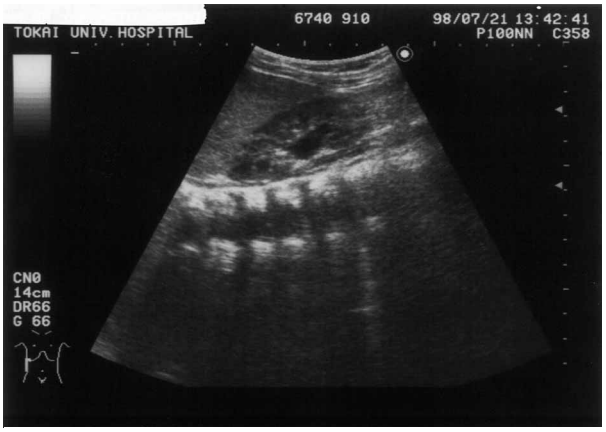

Fig. 2C

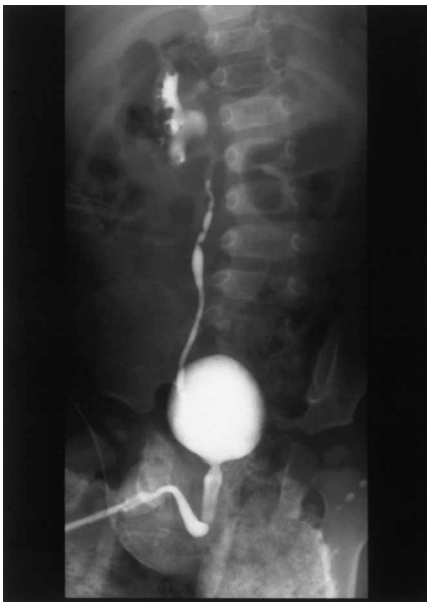

Fig. 2B

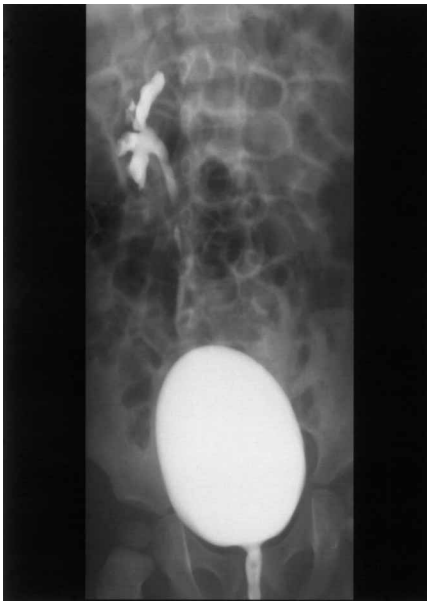

Fig. 2D

Fig. 2 **A**. Parasagittal sonogram of the right kidney in a 3-month-old child showing cystic changes in the central echo complex. **B**. MCUG showing grade II vesicoureteric reflux. **C**. Parasigittal sonogram of the kidney at 1 month of age showing dilatation of the renal pelvis. **D**. MCUG showing grade III vesicoureteric reflux.

periods in 36 cases (39%). Table 1 shows data from the children with perinatal hydronephrosis. 56 children (60.8%) showed neonatal renal pelvic dilatation. The structural dilatation ranged from 7 to 43 mm., and it disappeared or stabilized during the follow-up period in 56 kidneys. During the follow-up period, one boy with bilateral hydronephrosis and one boy with right-sided dilatation, had vesicoureteric reflux (Fig 2). The prenatal ultrasonograms of both boys showed mild hydronephrosis of 5–10 mm in the CEC, at the gestational age of 30 weeks. One girl with bilateral dilatation was diagnosed with vesicoureteral junction obstruction (Fig 3). The bilateral fetal renal pelvis of this child was 40 mm in diameter at the CEC at the gestational age of 30 weeks. No anatomic abnormalities were found in the other children. All cases of fetal

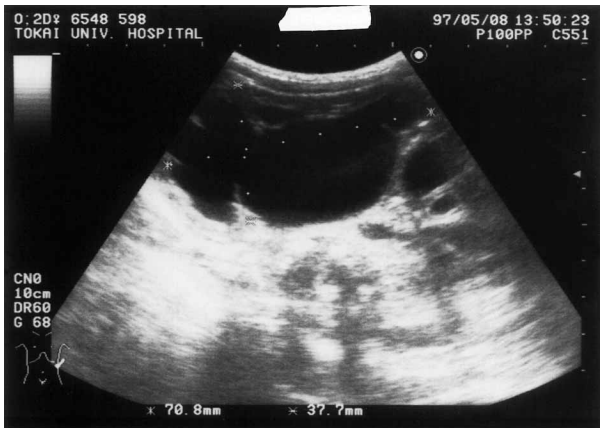

Fig. 3A

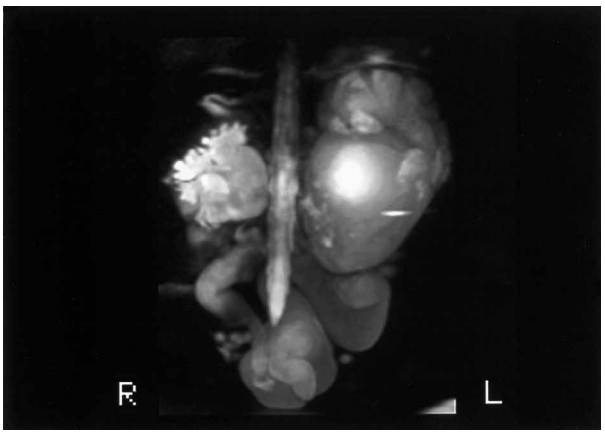

Fig. 3B

Fig. 3 **A**. Parasagittal sonogram of the kidney at 1 month of age showing significant cystic changes. **B**. MRI pyelogram showing severe hydronephroureterosis.

hydronephrosis revealed some degrees of renal pelvic dilatation in the postnatal period in this series.

DISCUSSION

With the aid of modern imaging modalities, the diagnosis of primary hydronephrosis can be readily made in the neonate. Prenatal sonographic diagnosis is gaining importance since fetal surgery is increasingly being used as treatment for these patients. It is important that the natural history of fetal hydronephrosis be determined. While surgical correction of this condition has been performed with great success, predictors to identify those infants who may benefit from surgical repair have not been established. Although hydronephrosis was clearly demonstrated by ultrasound in these 92 newborns, spontaneous improvement occurred in the majority of them. Scott et al found a weak but positive correlation between measurement and gestational age for normal and obstructive cases [2]. Koff *et al*. demonstrated that many newborns with severe hydronephrosis had no obstructions despite profound initial decreases in renal function [3]. Our series also demonstrates that most cases of hydronephrosis will spontaneously resolve in the follow-up period.

Several potential explanations exist for the common occurrence of renal pelvic dilatation in the prenatal period. Pregnancy is associated with physiologic changes in nearly every maternal organ system, and many of the alterations are mediated by pla-

cental hormones. It has been shown that increases in maternal renal plasma flow and glomerular filtration rate occur [1]. The fetus is subjected to the same hormonal and physiologic milieu as the mother; therefore, the same factors leading to maternal hydronephrosis may influence the fetal kidneys, leading to some degree of fetal hydronephrosis [4].

The mean fetal glomerular filtration rate (GFR) was determined to be 6 ml/min/1.73m^2 at 28 weeks' of gestation, increasing to 25 ml/min/1.73m^2 at term, and thereafter tripling by 3 months of age [5]. It is reasonable to postulate that an increase in urine output may lead to prenatal renal pelvic dilatation. However, no explanation exists as to why the incidence of hydronephrosis should be higher on the left side than on the right. We conclude that the majority of patients with hydronephrosis detected in the neonatal period can be followed conservatively, since only 3.3% required surgery based on follow-up ultrasonography at 1 month of age.

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